GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

The Virtue of Pride.

YORK, which has come down through history with the reputation of having been early a seat of learning, will lose nothing of that enviable reputation from events which have been taking place there during the present week. By the time this issue of the "JOURNAL" reaches its readers throughout the industry, the Seventeenth Annual General Meeting and Conference of the British Commercial Gas Association will have added yet another page to the wondrous history of York. It will prove a worthy page; and the industry will be the better for what it may record. York possesses a spirit of its own; and this spirit breathes in every line of the fascinating Presidential Address delivered by Mr. Alfred Procter, the Chairman of the York Gas Company, at yesterday morning's session. In writing it, Mr. Procter was under the spell of York; and in listening to it, the members must have been under the spell of Mr. Procter. It is not our intention to spoil the pleasure which readers will otherwise derive from its perusal by presenting them in this column with any disjointed version of the contents of the address. It will be found on subsequent pages of this number; and no one who thus fortunately becomes the possessor of it must deny himself, however busily engaged he may be, the delight of reading it.

In his address, Mr. Procter has striven to be worthy of York; and he has succeeded handsomely. The feeling of pride which he told his hearers those living in York have for the city is an ennobling thing. Imagine the difference between the outlook upon life of a man who lives in a place of which he is proud, and that of another man who dwells in a town of which he is ashamed. The idea occurs to one that persons who live, for example, in York, with all its glorious traditions, can have less excuse than some others if they do not lead good lives. Really this feeling of pride—the right kind of pride—exercises upon us all an influence of prime importance. And it is, of course, not merely a question of pride in our ancestors, and pride in the places in which our lot may happen to be cast. The ennobling current can flow into all manner of other channels as well.

There is our work, for instance. How fortunate is the individual who is engaged upon a task about which he can legitimately indulge in a feeling of special pride—something more, that is to say, than the mere spirit of satisfaction which is the result of undertaking any form of honest work. Here it is that we recognize the magnitude of the debt of gratitude which is owed by the British Commercial Gas Association—and indeed by those engaged in every branch of the gas profession—to Mr. Procter for his address, in which he points to many things (there are others of course; the scope of the address was not intended to include all) of which the industry and those engaged in it have every reason to be proud. In part, no doubt, what he said has been stated before, but we never remember to have seen the facts marshalled so as to present so convincing an array. The industry stands out as what it is—one to be proud of, with that sort of pride which is a virtue.

There is a good deal in the address upon the subject of advertising; and here again Mr. Procter was able to point to the highly creditable part played by our industry. The cultured publicity work of the "B.C.G.A." is an example to all of what advertising should be, just as the erection of unsightly bill hoardings where they are out of harmony with the surroundings provides an example of what advertising should not be. Perhaps we are unduly optimistic, but we are not without hope that a more enlightened age—educated artistically by such advertising as, for instance, the "B.C.G.A." are able to produce—will make out-of-place advertisement hoardings an offence against the law, precisely as they are now an offence against good taste.

If for nothing but this address—and the programme embraces various other attractive items—the York Conference of the "B.C.G.A." would have been well worth while. No matter what his part, each one engaged in the gas industry can justly feel that he is forwarding the interests of something which is for the great good of the community, and feeling so he will give of his best.

Progress.

A THIRTY-FOOT steel plate deftly slid into position by two men; the buzz of an electric motor; the sigh of compressed air released; and one of the side plates of a waterless holder, already shaped and meticulously drilled for close-pitched riveting, has been cold-flanged along its entire length. On the other side of the shop, a 30-ft. five-cutter milling machine with two head-stocks methodically shaping a stanchion plate in a single traverse. Such was the special machinery to which Messrs. R. & J. Dempster last week introduced upwards of 150 members of the Manchester District Institution of Gas Engineers and other visitors; and all realized, if they were not already persuaded, that the waterless gasholder has come to stay, in the form of the prototype or as some direct evolution therefrom. Of course, not even the waterless enthusiast anticipates that the column and spiral guided holder will in time be entirely superseded by the new-comer; but the latter will find a regular place as candidate, alongside the older designs—and, probably, a battery of sphericals—for every gas storage job that may be offered. Indeed, such status has apparently already been attained, for Messrs. R. & J. Dempster are at the moment carrying on their books orders for nearly 25 million c.ft. of that one type (the "M.A.N.") of storage; and as orders for new gasholders are comparatively rare occurrences, that figure must represent a very fair proportion of the whole currently planned extensions. Included in the total, by the way, is the gigantic 8-million structure to be erected at the Southall Station of the Gas Light and Coke Company.

Now the gas industry cannot claim to have displayed, in past years, the characteristic longing of the Biblical Athenians for some new thing; and even in these days, when all but the blind have left the rut of contentment for the highroad of progress, it is not surprising that controversy should have hovered round the putting into

practice of an invention which bade fair to unsettle the established ideas of gas storage, but our gasholder experts took the long view, and having, moreover, the courage of their convictions, they were not disheartened at hearing so few voices at first raised definitely in their support. Perhaps, too, they called to mind the criticism which greeted Gadd and Mason's invention, and then passed in mental review the scores of spiral holders which are the outcome. Be that as it may, plans were brought to fruition; the new idea took hold in a remarkably short time; and to-day two large groups of leading firms are in a position to avow the advantages of the tankless holder and undertake the erection thereof. As for criticism, the gas industry and the firms concerned will doubtless welcome it—provided it is constructive. Welcome, too, will be reports, as soon as experience permits their preparation, about the waterless holder in action. We endeavour to follow carefully the Technical Press of America and the Continent; and it is the fact that—apart from certain interesting details given by Mr. Frank Prentice in a debate on the subject before the Institution of Civil Engineers last June—the only account we have hitherto come across of the dry holder at work was the paper by M. A. Bazille, of Paris, at this year's meeting of the Association Technique de l'Industrie du Gaz en France. The paper was abstracted and commented upon in the "Journal" for Aug. 1, and it showed that complete satisfaction was the outcome of two years' trial of a small "M.A.N." holder at Gennevilliers; that an ingenious syphon arrangement had been added to drain-off deposited water floating on the tar in the sump; and that the various factors influencing the nature of the sealing liquid tended to counteract one another so that very few corrective additions or withdrawals of tar or oil had been found necessary.

Now we are looking forward to a contribution from this country to our knowledge of the new technique. We are aware that in favourable circumstances there can be a large saving in the costs of foundations by selecting the waterless holder; but detailed and reasoned comparisons would be most interesting. We shall expect to hear, too, of the advantages of constant pressure and the disappearance of "dead" space under certain district conditions with the older type, and of benefits derived in drier gas through the absence of water lutes. Then there is the question of the probable life of the seal—or, rather, the fabric, which in the "M.A.N." design contains the actual sealing medium, and with the latter constitutes the rubbing surface. Possibly laboratory methods will throw light upon what appears to be a dark subject. And when the time comes for repair or renewal of the fabric, what will be the method of effecting it? Again, the industry will hope for a statement of the costs of pumping and supervision, which will doubtless be shown as a contra to the saving in capital costs. Finally, there is the sealing liquid itself—is it to be an ordinary gas-works product, or a proprietary article? What modifications, if any, will have to be made in its constitution from time to time to suit changing atmospheric and works conditions? Herein lies, it seems, a fruitful field for research. But these are early days—it is only thirteen months since the Ipswich pioneer holder was put to work; and meanwhile we can register the progress and incidentally congratulate Messrs. R. & J. Dempster on their initiative and on their readiness to be of assistance to the gas industry generally.

A Paying Proposition.

All are in agreement regarding the necessity of supplying consumers with an ample volume of gas constant in calorific value, chemical composition, and pressure. Agreement, however, is only the commencement of the matter, and much remains to be accomplished before this desirable condition becomes established practice throughout the country. This applies particularly to the smaller undertakings; and as the Eastern Counties Gas Managers' Association draws its membership from 164 concerns, 95 of which have annual outputs below 25 million c.ft. per annum, it was singularly appropriate that the subjects of calorific value control and of technical control in the retort house should be discussed at the meeting of the Association on Thursday last.

Of the factors influencing the satisfactory use of gas, calorific value and pressure are the most important. The consumer is bound to suffer if there is fluctuation in either; and yet, at the meeting, instances were quoted of variations of as much as 100 B.Th.U. per c.ft. in the heat content of the gas distributed in some areas supplied by the smaller undertakings. And, let it be emphasized, these are the very areas which will suffer most from electrical competition when current becomes universally available throughout the country, and when an efficiency equivalent to that in our large towns and cities operates in every small village. True, the smaller gas concerns, usually burdened with heavy capital charges, have neither the technical facilities nor the money to spend on a large variety of control instruments; but, by taking courage—and only a little is required—they could improve matters beyond all anticipation. As Mr. Ronald B. Glover observed in his practical paper on "Technical Control in the Retort House," no small undertaking ought to be without a recording calorimeter; the initial cost may appear a good deal to over-cautious committees or boards of directors, but more than sufficient proof exists that the outlay can pay for itself in a very short time. Besides the fact that the consumer will derive satisfaction, the undertaking is certain to save money; for it will be able to supply gas of a value approximating to that of the declared standard—a proposition which is not practicable if reliance is placed on the misleading, out-of-date jet photometer. We have often been amused at the proud boast of some undertakings that they are supplying gas of a calorific value far in excess of the standard declared. This is simply bad business. The undertakings are losing considerable sums of money, and at the same time the consumers are not benefited. Much, then, can be done by the smaller concerns at comparatively little expense. All that is required is absence of fear on the part of those responsible. Recording calorimeters and similar instruments do not demand a high degree of technical skill in their manipulation, and foremen and workmen, though at first regarding them with distrust, quickly appreciate their value. Interpretation of the results, however, admittedly needs well-trained technicians; and it seems to us that this is where the larger undertakings could be of untold assistance to the small concerns. In this, as in most other respects, co-operation is desirable.

In the foregoing we have devoted our attention to control of calorific value, but there are many other directions in which the exercise of closer control can be equally beneficial; and a very valuable section of Mr. Glover's contribution was concerned with the need for more accurate weighing. The information at the disposal of many undertakings consists of the quantity of coal which passes over the weigh-bridge into the works, and the amount of coke which is sold to consumers. There are no data regarding the coal fed to the retorts, the coke discharged, the weight of coke other than breeze burned under the boilers, and so on. Yet all such information is essential to economical working, and can be made available without much trouble and at little expense. To express the matter in a single phrase, technical control is a proved paying proposition in all gas undertakings—large and small alike.

A Calorific Value "Robot."

A further paper at the meeting of the Eastern Counties Gas Managers' Association was by Dr. J. G. Stewart, whose observations on the automatic control of calorific value amplified in one important particular Mr. Glover's remarks on the general need for control in the retort house. Dr. Stewart's contribution may well be divided into two phases of automatic control—that of the calorific value of the coal gas made in horizontal retorts, and that of the correct mixing of water gas with the coal gas. With regard to the former, the principle consists of increasing the pull on the retorts during the early stages of carbonization, and decreasing the vacuum during the later stages. In our opinion the principle is sound up to a point; the limit being reached when furnace gases are drawn into the retort. We are fully aware that several undertakings bring down the calorific value of their gas to the desired standard by deliberate over-pulling, and that by doing so the thermal yield per ton of coal carbonized may actually be increased, due to the reaction

of the carbon dioxide and steam in the indrawn gases with the incandescent coke. The fact remains, however, that such a practice renders the retort more porous by burning off the scurf; and all gas engineers realize the marked difference between the leakiness of a new retort and one which has a coating of carbon. Moreover, over-pulling necessarily adds to the inert content of the gas sent out on to the district—which content must have an appreciable effect on the specific gravity of the gas, and must increase distribution costs. The pumping of inert gas through pipes which in most cases can hardly deal effectively with the present loads is as bad as adding ash to coal and transporting the whole bulk to its place of treatment or consumption.

It has to be remembered, though, that with ordinary working—that is, under the condition of constant vacuum—the greatest leakage of valuable therms takes place during the first hour or so after charging. This point was emphasized by Mr. H. Hollings in his paper before The Institution of Gas Engineers at the meeting in Cardiff last June. It is thus obviously desirable to withdraw the gases from the retorts during the early period of carbonization at such a rate that leakage of the coal gas into the setting does not occur, and that in-leakage of the furnace gases does not take place. This demands a higher vacuum than that operating during the closing stages of carbonization, when the rate of evolution of gas is lower; but when automatic control is effected at the exhauster, it follows that when the vacuum is increased after charging, those retorts in which carbonization has advanced further are also subjected to the higher vacuum. How far the advantages of the greater pull on the newly-charged retorts are counterbalanced by the disadvantages of over-pulling on the other retorts, is a matter for investigation.

Those present at the meeting last Thursday were impressed not only by the simplicity and ingenuity which characterize the automatic control instrument—the "Sigma"—described by Dr. Stewart, but by its possibilities; and considerable discussion centred round its application to the governing of dilution of coal gas with water gas. The control is effected at the inlet to the exhauster. As the calorific value of the coal gas increases, so the quantity of diluting gas is increased, and *vice versa*. Hand control of the mixture is both costly and unsatisfactory in comparison with automatic control, as judged by small-scale experiments; and though automatic mixing is not yet an established fact in gas-works, we have little doubt that it very soon will be. With regard to the general question of water gas dilution, we call attention to the remarks of Mr. Frank Prentice, who explained that many difficulties are avoided at Ipswich by making coal gas and carburetted water gas of approximately the same calorific value.

Upkeep of Verticals.

Among the first settings of the Glover-West system of continuous carbonization in vertical retorts was that erected in 1910 at the Droylsden Works of the Manchester Corporation Gas Department—works which have always been regarded as the experimental station of the Department. During the early years, trepidation was felt generally that the upkeep of continuous verticals might contrast unfavourably with that of the well-tried horizontal system, and might, indeed, constitute an obstacle to the advance of the method. Experience, however, proved any such fear to be unfounded; and our readers will remember the careful and detailed account of the maintenance costs of the Droylsden setting which Mr. William Buckley gave to the Manchester District Institution of Gas Engineers in 1923, and which was published in the "Journal" for May 16 of that year. The figures which he then presented—and which certainly did not err on the low side—related to a new plant having the inevitable minor drawbacks of any pioneer enterprise, and they covered the working of the plant from 1910 to 1921. In the latter year, the setting was reconstructed; the retorts were arranged for heating in units of two instead of units of four, which greatly simplified the control of heats; and the major axis of the retorts was increased. The net result of the improvements and alterations was that the gaseous yield of 68·6 therms per ton of coal carbonized in the original plant was raised to 79·6 therms in the reconstructed setting—a fact which has had considerable bearing on the maintenance costs of the latter. And in this respect, Mr. Buckley emphasizes that valid comparisons of carbonizing plants can only be made when the basis is per therm of gas produced, and not per ton of coal carbonized.

The maintenance costs of the reconstructed setting during the period from the end of 1921 till the beds were let down in August of this year were set out by Mr. Buckley in a paper before the Manchester District Institution last Wednesday; and the same meticulous care which characterized his former contribution is evident in the present one, which completes a highly interesting numerical story of plant life. The circumstances operating during the two periods were so vastly different that comparison is difficult, if not entirely futile. Post-war labour charges and costs for raw material and for replacements bear no relationship with those current in the halcyon years 1910 to 1914; and during the period from 1922 to 1928 the coal strike of 1926 was an unnatural and disturbing factor. In spite of all this, however, and taking into account that the maintenance of a reconstructed setting cannot be expected to be cheaper than that of a new plant, the total maintenance costs of the retorts and producers in the latter period worked out at only 0·1467d., compared with 0·0946d. for the new plant, per therm of gas made. The comparative figures based on per ton of coal carbonized show wider divergence—11·687d. in 1922-28, as against 6·50d. in 1910-21—but, as we have already mentioned, such a basis is not a good one.

Nothing is to be gained by drawing rash conclusions from Mr. Buckley's figures. Before making any definite statements, we would like a very long sheet of paper divided into four columns. In the first two we should require information, for every year, of the labour charges, cost of raw materials, index prices of gas compared with index costs of living and selling prices of other fuel, amounts received for coke and other bye-products, and so on, together with the maintenance costs of verticals; and in the last two columns we should require the corresponding figures for a horizontal installation of the same capacity and of the same age. As, however, we are unlikely to obtain these figures, we will refrain from criticism, and confine ourselves to one or two of the main data given by Mr. Buckley. The temperature of the setting—1100° to 1250° C.—was not high; and this doubtless had its influence on the life of the setting and on the throughput of coal. In the first period the setting worked for 40,456 retort days, and the average working days per retort amounted to 1250; in the second period, the corresponding figures were 26,451 and 1653. From 1910 to 1928, repairs and maintenance cost 0·115d. per therm of gas produced, and the average gaseous yield was 72·5 therms per ton of a calorific value of 462·5 B.Th.U. per c.ft. These are among the outstanding points; but before concluding our brief note on Mr. Buckley's analysis of costs—an analysis which will be of the greatest value—we call attention to the extraordinary flexibility of the vertical system, which proved such a boon at the Droylsden Works during the coal stoppage, and to the influence of continuous operation in reducing maintenance costs. This is clearly shown by comparing the data for Bed No. 2 with the figures for Bed No. 1.

Railway Revenue Returns.

With less than three months of the year to go, the railways are not within sight of their standard revenue. For the first forty weeks of the year there has been a fall in the traffic receipts of the four big groups of over seven-and-a-quarter million pounds, or 5 p.ct., as compared with the corresponding period of 1927. The railways that depend most upon the heavy industries have naturally been the hardest hit; but even those which are regarded more from the passenger point of view have suffered severely. Mr. Robert Bell, Assistant General Manager at King's Cross of the London and North-Eastern Railway, lately drew attention to these facts in a speech to railway students. He remarked that the Railways Act of 1921 laid down that the amalgamated groups were entitled to a standard revenue, and then went on to say that this Act was framed during a period when most politicians

and business men were deceived by an appearance of prosperity, and with the Minister of Transport seemingly ignoring the possible effects of motor competition. Even had different views been held by politicians and business men at the time of the passing of the Act, one wonders what other provisions would have been made. The scheme of amalgamation was supposed to be in the interests of economy and efficiency; no other considerations could have justified the course. In addition to this, however, charges have been placed upon such a level as to engender the keenest road transport competition in every direction.

As we have said on previous occasions, the financial stability of the railways is a national question; for they are vital to our industries. Where, then, are remedies for the existing stae of affairs to be found? The question is one to which the railways themselves should be able to supply the answer—if there be one. Were a suggestion for improvement from outside permissible, we would venture it in the form of a plea for the cultivation of goodwill on each and every occasion. Goodwill is more than a pleasing atmosphere; it is a real business asset. It pays every time. There are at least two ways of doing most things; and the one to choose is that which is most likely to foster goodwill. The writer, with sundry painful recollections of wordy encounters with those in charge of hired conveyances, yet cherishes the remembrance of the manner in which he was induced to pay about double the regular fare by the driver of a South of Ireland jaunting car. There was a time when the gas industry was far from guiltless of hedging round by irritating restrictions its business transactions with consumers. Some who read this note may recollect a story which appeared many years ago in a daily paper, of a consumer who desired to have fixed a gas fire or cooker. All kinds of formalities had to be gone through; but the delays did at last come to an end, and the apparatus was taken to the premises for installation. Alas, as the workmen carried it up the stairs, they met on the way down other men, who bore a coffin —containing the body of the consumer.

Much gas has passed through the mains since then, and such a joke would now have lost what point it may ever have had. "In future traffic is not going to come automatically to rail as it used to do," said Mr. Robert Bell to the railway students. Exactly; the gas industry went through precisely the same experience, and emerged immeasurably stronger for it. In place of harassing formalities, the customer is studied in every way possible; goodwill is both taught and practised in gas undertakings large and small. In the conduct of their business, assistants have even been urged to adopt the attitude that "the customer is always right." Has such a view ever been impressed upon any body of railway officials who come in contact with the public? If so, it has not been impressed deeply enough. Frankly, we should like to see our railways laying siege by every means in their power to the heart of the Fairy Godmother "Goodwill," who calls down in abundance upon those who successfully woo her blessings such as should be enjoyed by so great a public utility service as the railways of this country.

Calorific Values in the Metropolis.

The reports of official gas testings in the Metropolis for the quarter ended Sept. 30 shows that the average calorific values of the gas supplied over that period have been quite near, but in all cases above, the declared figures of the respective Companies. Thus the workings have been good, and the consumers in the different areas have been receiving a trifle more than they have paid for. There is therefore no hardship on this score. Our contemporary the "Engineer" has, however, been pointing out that, while much attention has recently been directed towards the disadvantages arising from a diversity of voltage, &c., in public electricity supplies, little or no consideration has been paid to the lack of uniformity in public gas supplies. Such lack of uniformity, it is admitted, is in the case of gas supplies much less important than in that of electricity supplies, for all gas-consuming apparatus can work with little change of efficiency over a fairly wide range of pressure and calorific value.

Why They Differ.

However, the writer of the note is of opinion that the fact that the London Gas Companies are not alike as regards the calorific value which they are required to maintain may entail some disadvantage. Even though the practice of charging for gas by the therm would appear to eliminate any unfairness in the relative charges in the areas served by the Companies, he thinks it is, "in practice, fairly certain that an average gas consumer removing (say) from the Wandsworth to the South Metropolitan area would fail to realize that less gas than formerly was required for a given heating effect, or would fail to effect the necessary change of habit in the setting of the taps, and would, as a consequence, find the quarter's bill higher than before." We would point out that the value fixed in each case is that at which it is deemed the best working results can be secured by the particular Company concerned, and therefore (as the interests of Company and consumer are one) the value at which the consumer will get the most satisfactory return for his money. To bring all the Companies to one level of calorific value would probably prejudice the non-moving consumers more than it would benefit those who might shift to other areas by reason of such circumstances as our contemporary envisages, but which, after all, might never arise. Of course, the appliances in any area are adjusted to consume efficiently the gas supplied in that area.

Gas on Trains.

It was hardly to be supposed that the suggestion that the fire which followed the terrible railway collision at Charfield was caused by compressed gas (in all probability Pintsch gas) issuing from a cylinder would escape notice in various quarters. Where human life is at stake, other considerations must give way; and if gas possesses disadvantages in this respect which the provision of safety valves or other automatic devices cannot overcome, one could not wish for its retention, in spite of the fact that the light it furnishes by means of mantles is found by so many people to be far superior for reading purposes to that diffused by such electric lamps as are sometimes found in railway carriages. It is, indeed, evident from statements made at the inquest that the L.M.S. Railway are actively substituting electricity in their gas-lighted coaches. All the vehicles constructed by them during the last five years, with the exception of the kitchen cars, have been electrically lighted; and gas-lighted coaches are being broken up at the rate of nearly a thousand a year. There appears still to be some mystery about the cause of this appalling catastrophe between a fast passenger train and two goods trains under a railway bridge, which resulted in the building-up of a mass of wreckage. It is only fair, however, to point out that, had it not been for the collision, there would have been no fire. Moreover, should an electrically lighted train travelling at 60 miles an hour come to grief in this way, there still would be more than a remote possibility of fire starting from the red-hot fuel scattered from the fire-box of an overturned locomotive.

Taxation Policy.

The Federation of British Industries have recently had under consideration the policy to be pursued by them with regard to industrial taxation. On the broader points of taxation, it may be stated that, in the event of the Government finding it possible to make any reduction, the Federation are of opinion that primary consideration should be given to reducing the standard rate of income-tax; and they will press for the restoration of the penny post. There are also various other points to which they think attention should be given. For instance, they will request the Chancellor to remove an anomaly in regard to the payment of stamp duty on amalgamations. At present relief from stamp duty is given where the firms composing the new amalgamations have already paid stamp duty; but if any of the companies concerned raised its capital before the passing of the Stamp Act, and therefore did not pay stamp duty upon it, it does not receive relief. As it is believed that Parliament gave this relief with the intention of encouraging healthy amalgamations, the Federation consider that the anomaly should be removed.

PERSONAL.

On Oct. 13, at the second annual dinner of the Gas and Water Department of the Wallasey Corporation, a presentation of a gold watch was made to Mr. J. H. Crowther, who, as already announced in the "Journal," recently retired from the position of Gas and Water Engineer to the Corporation. Alderman A. H. Evans, a former Chairman of the Gas and Water Committee, in making the presentation, paid tribute to the valuable services which Mr. Crowther had rendered not only to the town of Wallasey but also to the gas industry generally. He had served the Gas and Water Department for 37 years, and the employees at the gas-works had always found him a just Chief. Mr. H. B. Holliday, the present Gas and Water Engineer, spoke of the help and advice he had received from Mr. Crowther. It may be mentioned that Mr. Crowther's son at present holds the position of Deputy Engineer to the City of Bradford Gas Department.

Mr. Bernard F. Browne, the Chief Engineer to the City of Santos Improvement Company, left Waterloo on Thursday morning last for Southampton, to join the R.M.S.P. "Alcantara," on his return to South America. With him were Mrs. Browne and several of his family. To bid them *au revoir*, a number of friends had gathered, including Mr. W. M. Mordey, M.Inst.C.E., of Messrs. Mordey & Levin, the Consulting Engineers to the City of Santos Improvement Company; Mr. Thomas Glover, M.Inst.C.E., of Norwich; Mr. Ronald B. Glover, Assoc.M.Inst.C.E., of West's Gas Improvement Company; Mr. Walter T. Dunn; and Mr. Henry Kearns, Secretary of the Montevideo Gas and Dry Dock Company. Mr. Browne, who appeared to be in the best of health, expressed on behalf of his wife and himself their warm appreciation of the presence of so many of their friends. A choice bouquet was handed to Mrs. Browne just before the train steamed from the station.

OBITUARY.

The death has occurred at Eckington of Mr. William Hughes, who for 35 years was the Manager of the Eckington and Mosborough Gas Company, Ltd.

We learn with great regret of the death of Mr. James Smith Turner, in an Aberdeen nursing home on the 8th instant. Mr. Turner, formerly with the Mirfield Gas Company, had for 31 years held the post of Manager to the Thurso and North of Scotland Gas Corporation, Ltd.

It is with regret that we announce the death at Southport on Oct. 13, of Mr. R. M. Brooke. The name of Mr. Brooke is widely known in connection with retort settings of both the horizontal and the vertical types. For the past two and a half years, deceased was a member of the staff of Messrs. W. J. Jenkins & Co., Ltd., of Retford.

The death has occurred at Whitchurch, Glamorgan, of Mr. Robert Percival Jones, coke salesman to the Cardiff Gas Light and Coke Company, and Organizing Secretary of the Company's Athletic and Social Club. Mr. Jones entered the service of the Company in 1909, and since 1918 has acted as their representative at agricultural shows throughout the country.

FORTHCOMING ENGAGEMENTS.

Oct. 26.—London and Southern District Junior Gas Association.—Meeting at the Westminster Technical Institute, Vincent Square, S.W. 1, at 7.30. Presidential address of Mr. W. T. Kenshole, of Lea Bridge,

Oct. 27.—Yorkshire Junior Gas Association.—Annual general meeting at Leeds University. Address by Mr. E. J. Sutcliffe, Gas Engineer and Manager, Bradford.

Nov. 2.—Gas Companies' Protection Association.—Annual general meeting at the Caxton Hall, Westminster, at 3 o'clock.

Nov. 3.—Midland Junior Gas Association.—Visit to the Shrewsbury Gas-Works.

Nov. 6.—Society of British Gas Industries.—Council meeting.

Nov. 14.—Southern Association of Gas Engineers and Managers.—General meeting at the Hotel Cecil, Strand, W.C. 2, at 2.15 p.m.

Nov. 22.—Society of British Gas Industries.—Autumn general meeting. Hotel Cecil.

The Institution of Gas Engineers.

Nov. 12.—Corrosion of Pipes Committee, 4.30 p.m.

Nov. 13.—Gas Education Executive Committee, 4 p.m.

Nov. 14.—Finance Committee, 10.30 a.m.; Benevolent Fund Committee, 11.0 a.m.; Executive Committee, 11.30 a.m.

INTERNATIONAL COMMISSION ON ILLUMINATION.

The above Commission met in full session at Saranac Inn, N.Y., on Sept. 24 to 28, and obtained an attendance of 76 delegates from eleven countries in all.

The Commission, under the presidency of Mr. Clifford C. Paterson, supported by Dr. J. W. T. Walsh (the General Secretary) and M. A. Filliol (the Treasurer), had a full programme covering many phases of illumination work.

The subjects dealt with were as follows: Street lighting; light flux distribution; daylight; automobile headlights; photometric test plates; teaching the art of illumination; vocabulary; aerial navigation lighting; definitions; diffusing glassware; photometric precision and fundamental standards; factory and school lighting; signal glasses, residence lighting; kinema lighting; show window lighting; glare; revision of the statutes of the Commission, &c.

The number of subjects involved meetings held concurrently; and so far as the British delegation was concerned, arrangements were made for the allocation of work and attendance at the various meetings among its members. This delegation, with Mr. R. Watson as leader, consisted of representatives of the Illuminating Engineering Society, the Institution of Electrical Engineers, The Institution of Gas Engineers, the Association of Public Lighting Engineers, the National Physical Laboratory, and various other technical and industrial bodies. Everything possible was done by the American National Illumination Committee, assisted by the U.S.A. Illuminating Engineering Society, in the interests of the work.

ON THE ELECTRICAL SIDE.

Effect of Trade Depression upon the Electrical Industry.

Something is done by the Economic and Statistical Department of the British Electrical and Allied Manufacturers' Association, in a report which they have lately issued, to deal with what they regard as a general assumption that the electrical industry, on both the supply and the manufacturing sides, has before it a future of great expansion, and that only an economic crisis of unusual severity would serve to interrupt the rising curve of production. As a matter of fact, it is said, the industry has now reached a stage in its development where it is peculiarly sensitive to changes in the industrial and general economic position of the country, and reflects at once movements either of depression or of increased activity. In time the electrical power production of the country should provide the most reliable and the most immediate indication of the state of industry, and even now it affords a clue to many developments which would otherwise remain hidden.

A Steady Decline in the Rate of Advance.

It is pointed out in the report that the truth of the observation above reproduced may be found in the course of electrical power production in the main industrial centres during the first eight months of this year. The normal rate of expansion lies annually between 10 and 11 p.ct., but this year it has been less than 7 p.ct. Since the first three months, when, compared with the first quarter of 1927, an improvement of exactly 10 p.ct. was recorded, there has been a steady decline in the rate of advance until in August of this year it showed less than 5 p.ct. Such a movement, it is added, can scarcely be regarded as satisfactory, in view of the initiation of the national scheme, and can only be attributed to intensified trade depression. It has discounted for some time the possibility of rapid expansion in power production, and has allowed the capacity of new generating plant installed to draw level with power demand and make good the shortage indicated at the beginning of this year. The general trade depression has been accompanied by depression in the power industries, and there are few indications of recovery.

Details from Districts.

If the principal industrial areas are examined, it is found, the Department add, that in the first three months of this year the South-West Midlands and the Mersey and West Lancashire area, which cover engineering, motor manufacture, metal working, marine transport, shipbuilding, and chemical manufacture, were most active of all; the rate of increase being about 19 p.ct. over the previous year. Since then, however, there has been a steady decline in both areas. Thus in the South-West Midlands the average increase for the first eight months was 14 p.ct., but it had fallen to 9 p.ct. during the three months ended in August, to 6 p.ct. in the last two months, and it now shows only 1 p.ct. increase over the corresponding figures for 1927. This can only indicate that the industries in the Midlands are rapidly overtaking their orders and consuming, as a consequence, less electricity. Developments were less marked in the Mersey and West Lancashire district, where the average increase during the first eight months was 12 p.ct., falling to 6 p.ct. during August. In Lancashire and Yorkshire similar

movements have taken place; but in these areas the rate of expansion was less during the first eight months, being only 7 p.ct. in Lancashire and 8 p.ct. in the West Riding. They fell in the case of the former to less than 2 p.ct. during the last two months, and in the latter to less than 3 p.ct.

The only two areas in the country which have shown a tendency to improve their position as the year goes on have been the North-East Coast and Sheffield districts and the West of Scotland. The average rate of expansion in the North-East Coast and Sheffield districts was only 5 p.ct. during the first eight months of the year; but it has risen 7 p.ct. In the West of Scotland a consistent average of 9 p.ct. has been maintained throughout the entire eight months. In both these areas progress has been due entirely to the revival in shipbuilding and in the demand for steel; but, with the exception of the West of Scotland, the rate of expansion cannot be regarded as very satisfactory. In the London area, developments have been exactly similar to those in the Provinces.

The report, which is not an exhilarating one, shows that on the whole the electrical industry, on both supply and manufacturing sides, is not at present in a position markedly different from that of the other basic industries of the country.

THE GAS INDUSTRY AND HIGHWAY PROBLEMS.

By R. W. EDWARDS, Chairman and Managing Director of the Aldershot Gas, Water, and District Lighting Company.

II.—THE GENERAL SITUATION.

Hitherto I have been regarding the questions raised by modern methods of highways construction solely from the standpoint of my Company; in this article, as is indicated by its title, I intend to make some attempt to review the situation in the most general manner possible—that is to say, as far as possible from the respective points of view of all concerned—and, incidentally, to note the measure of success which has attended such attempts as may have been made to improve this situation. First of all it will be necessary to summarize the present law bearing upon the points at issue.

The present law on the subject of mains and cables in highways may be said to be embodied in Section 75 of the Wessex Electricity Act of 1927, which section incorporates, with some slight modifications, the well-known "Maybury Clause." This section does not make any attempt to cope with the problem of the ferro-concrete surface—presumably because that problem had not arisen to any marked degree when the Act was drawn up—and it is to a corresponding degree obviously inadequate. In its treatment of the vexed question of the costs of removal of mains and apparatus, the Maybury Clause is very much more favourable to the Highway Authorities than to the Public Utility Undertakers, in that it stipulates that such costs are to be borne by the undertakers unless the existing apparatus was laid under the powers of the Act, and in accordance with its directions—which directions are to the effect that the undertakers must notify the authority of their desire to avail themselves of the provisions of the Act as to payments, and must lay their apparatus according to the directions of the Highway Authority and under the supervision, if so desired, of its surveyor.

Is this enactment adequate in the light of recent developments in the construction of roads? I think that Sir Henry Maybury himself would be the first to say that it is not. The application of such a provision to cases in which roads are reconstructed in ferro-concrete would, to my mind, lead to monstrous injustice. Surely, you may say, if this is so, the fact would be recognized by the more far-seeing among us, and some attempt made to alleviate the situation by a reform of the law in regard to it. Such efforts have indeed been made—mainly through the agency of the Conjoint Conference of Public Utility Associations, whose activities fall next, by a natural sequence, to be noted.

I have before me as I write a copy of the latest report of the Conjoint Conference of Public Utility Associations, which report gives a very fair indication of the work of this body and of the measure of success which has attended that work. The Conjoint Conference has been in existence for some three years now. Among its members are many of the most distinguished men in the respective undertakings which it incorporates; further, it has worked whole-heartedly for the benefit of those undertakings. On the subject of the Bridges Bill the Conference sent a Memorandum to the Ministry of Transport to the effect that adequate accommodation should be provided for sub-surface works of Public Utility Undertakings when bridges were reconstructed, and that the cost of removing any mains under the Bill should be borne by the Highway Authority. The Ministry agreed to the insertion of a clause to protect the existing rights of Public Utility Undertakers, but refused to consider the question of accommodation. The Bill was twice introduced in the House of Commons, but was blocked on each occasion by members at the instance of the Conjoint Conference. (It is likely to come before the House again during the coming session.) In spite of this and other good work done by the Conjoint Conference, however, I am strongly inclined to agree with the following words used in regard to it by Mr. Alfred Dryland on June 20 of this year (on the occasion of his installation as President of the Institution of Municipal and County Engineers): "It will be known that negotiations have been taking place for some three years past between road authorities and public utility undertakers with a view to coming to an agreement as to a desirable amendment of the law in regard to the opening and reinstatement of trenches in highways for laying mains, cables, &c.; the object being to secure the least detriment to their daily use as highways, while affording all reasonable facilities for other services. I am sorry to tell you that the divergencies of view are, at present, so great that speedy agreement is not probable." The line of settlement of the problems treated of in these Articles has been that of amicable agreement between public utility undertakers and highway authorities—a most excellent line to take in theory, but in my experience of its working a most ineffectual one in practice.

The Gas Companies Protection Association, too, has made some attempt to obtain a settlement of the highways problems—a settlement, that is to say, acceptable to gas undertakings as well as to the other interests concerned. At a meeting of the Association held on May 14 of this year, it was at my instigation decided "to write to the Ministry of Health and the Ministry of Transport asking that in cases of loans or contributions towards the cost of remaking existing roads in ferro-concrete, it should be made a condition of such loans or contributions that the road authorities should repay the gas companies the cost of removing, renewing, or replacing mains and services, and that, if necessary, the amount of the loans or contributions should be increased so as to cover such costs." Owing to delay of waiting to submit the letters in question to the Conjoint Conference at its next meeting, held some two months later, they were not sent till July 26, and it will be apparent to all that this date, being near the end of the session, was an inappropriate one at which to endeavour to call the attention of Government Departments to a far-reaching problem. On Aug. 3, the Ministry of Health replied to the effect that it had no authority to proceed in the manner suggested, but that the suggestion had been noted for consideration "should relevant legislation be introduced into Parliament at any time." The reply from the Ministry of Transport, dated Aug. 8, stated "that the experience of this Department lends no support to the suggestion that special conditions should be attached to grants made from the Road Fund towards the cost of this class of work."

The attitude of the gas industry towards highway problems and the manner in which such problems affect that industry having been dealt with to some extent, the next point to be considered is the position of the other interests which any remedial legislation on the questions at issue would of necessity affect. So far as electricity and water are concerned, I may safely state—as a representative to some extent of such undertakings—that here their interests are identical with those of gas, whatever differences of opinion may unfortunately exist between them in regard to other matters. The aim of the Highway Authorities is, of course, to avoid expenses in regard to the breaking-up of roads, and the inconveniences attendant thereon. It will thus be seen that while their standpoint seems at first sight to be directly opposed to that of the public utility undertakings, nevertheless, if one takes the broad view, their interests are practically identical; and any measure which aims at precluding the necessity for breaking-up roads, with the expenses and inconveniences involved therein in the light more particularly of the increasing use of ferro-concrete in the construction of roads, should be equally acceptable to both Highway Authorities and Public Utility Undertakings.

There still remains another interest involved in the question under review—an interest which will receive a great deal of consideration from Parliament—to wit, that of the road user. This interest it is which has led to the recent developments in roads construction which have given rise to the whole problem under treatment; and it is somewhat appropriate that it should be a Bill drawn up from the point of view of the road user that to my mind affords the most likely basis for a settlement of that problem. I refer to Lord Montagu's Roads Protection Bill. Might I again quote from the leading article in regard to this Bill in the "JOURNAL" of July 18 of this year? "We should not mind that, provided it was a basis which recognized the need of every public service and the requirements of accommodation for the distribution of necessaries and commodities." In my next article I shall do my best to prove that the Roads Protection Bill does in effect provide just such a basis.

"B.C.G.A." YORK CONFERENCE.

Oct. 22 to 24, 1928.

[The General Report of the Proceedings will appear in the "JOURNAL" for Oct. 31.]

PRESIDENTIAL ADDRESS.

Beauty and Industry as Partners.

By ALFRED PROCTER, CHAIRMAN OF THE YORK GAS COMPANY.

Introduction.

This is the Seventeenth Annual Conference of the "B.C.G.A.," and I have the pleasure to welcome the delegates to one of the most ancient, most celebrated, and most beautiful cities in this land. We in York are proud of our city—of its history, of its buildings, and of its traditions. It is hard to speak of its stirring history without launching out on a long eulogy which would here be out of place, for no city in the kingdom is richer in relics of the past. For 300 years York was the home of Roman legions; twice it was virtually the capital of England; and all through its history it has given welcome to emperors and kings, to prelates and statesmen. I could not hope to tell you a tenth of its glories; but in a city whose every stone is eloquent of the past, what real need have I to attempt such a task?

Of our traditions—religious, civic, and commercial—let me speak equally briefly. For over eighteen centuries York has been in existence, and for sixteen of those centuries it has been the centre of an episcopal see. It is our great good fortune—a good fortune enjoyed to an equal extent by no other city in England—that our commercial development has in no way destroyed our intimate connection with the past. We have reason to be extremely grateful to our local industries for the way in which they have consistently respected our high traditions, and have always striven to make the present age a worthy successor of those which are gone, and an age of which our descendants may well be proud.

In considering therefore what I might aptly choose as the theme of my Presidential Address, I was, naturally, as I believe, guided by what I regarded as *the fitness of things*. We have met at Manchester and considered commerce; in Sheffield, Birmingham, and Newcastle and dwelt on industrial matters; in the great port of Liverpool and debated on social needs and their fulfilment; in London and considered finance; and so on.

I have been emboldened by the environment and history of this jewel among English cities to say a few words on beauty and industry as partners; and I trust that you will not think that my remarks are too remote from the sale of gas to be of service to you in your daily work.

PART I.

The unfortunate idea that Industry is naturally divorced from Beauty is happily passing, but there are yet many who think of Industry as a necessary evil, a disease to be endured. For them the outlook is indeed gloomy, for Industry is undoubtedly growing, and if it is entirely divorced from Beauty—and even more, definitely antagonistic to it—all loveliness will gradually disappear from the world. We are bound to admit that there is considerable justification for the view that industrialization creates ugliness; but, while it is easy to point out some glaring modern instances of the evils of industrialism and mechanization, it would be fairer to take a general survey. Let us see whether, in the past, commercial enterprises have always ousted beauty.

Commerce and Beauty in the Past.

It would be fairly safe to say that in Imperial Rome we have the first instance of a people who were in the modern sense commercial-minded. The Romans came nearest in the ancient world to our modern ideal of erecting buildings which are frankly and unashamedly utilitarian. A comparison of the architectural remains of ancient times is interesting; it is significant that while the ruins of Egypt and Greece are chiefly those of temples and tombs, and Assyria has left us little but fragmentary palaces, we have in the remains of Roman architecture the works of a practical people—baths, streets, marketplaces, aqueducts, and theatres. Vitruvius, the Roman architect, and the only ancient writer on the art whose works have come down to us, lays down three qualities as indispensable in a fine building, *Firmitas, Utilitas, Venustas*—Stability, Utility, and Beauty. And it was precisely because the Romans thought it was worth while to devote to the building of an aqueduct as much care as in the Middle Ages was devoted to the building of an abbey, because they saw that a thing is always beautiful if it completely fulfils its purpose, that their commercial buildings were never ugly. The Roman aqueduct, with its graceful proportions and its entire absence of architectural superfluity, is a work of art. The Romans give us a most inspiring example of a people, practical-minded and engaged in the most utilitarian enterprises, who produced the most beautiful and lasting works of art.

The Renaissance does not appeal to one primarily as a period of commercialism, but we must remember that the rich productiveness of the period was not confined to works of art simply; it was a period of great merchants, scientists, and explorers. Was not the Elizabethan age in England one of commercial prosperity, when our overseas trade increased enormously? Coming still nearer to our own time, was not the industrial revolution of the beginning of last century accompanied by the romantic revival in literature and art? It is surely significant that in England the two great periods of artistic achievement, the Elizabethan and the Victorian, were also periods of great commercial prosperity.

The Industrial Revolution.

It is when we come to the industrial revolution in England that we find so much to deplore from the æsthetic point of view. Before that industrialism had not involved mechanization, but with the coming of machinery came great ugliness. Men were so much excited by the prospect of mass-production that they did not trouble to consider whether their activities involved the creation of ugliness; and so the face of England was blotched with mines and factories, and scarred with rows of artizans' houses.

The early decades of the industrial revolution have much to answer for, for they have led us to think that ugliness is a necessary concomitant of industry. In the present century, though the industrialization of England has brought a great deal of ugliness with it, there is hope in the fact that people are aware of the harm that is being done to the amenities, and are taking steps to prevent it. Manufacturers have realized that workmen are happier and work better in beautiful surroundings, and we now have commercial colonies, of which there are excellent examples here in York, which are actually pleasing to the eye. There is no reason why any of our industries should have definitely unpleasant surroundings, and there would seem to be no reason why most of our factories should not be works of art, instead of merely works.

Present-Day Tendencies.

There is abundant evidence to show that those who care for beauty are alive to the real need for protest against unnecessary ugliness. Many letters have been printed in "The Times" recently on traffic noises, on ugly petrol filling stations, on commons preservation, and on the erection of unsightly houses. Our own northern Press has consistently fought for beauty, especially in the campaign for the abatement of smoke—that destroyer of beauty both material and spiritual. And one of the most discussed books of the last few months is Mr. Clough Williams-Ellis's "England and the Octopus"—a scathing attack on those who are spoiling our countryside by the building of ugly dwellings. People have obviously realized that ugliness is a vice which has to be combated.

Our general view of industrialism seems to indicate that, though it is easy for it to produce ugliness, it is not in the least a necessary accompaniment. Is not all industry directed towards greater prosperity and happiness in our everyday life?

And is not beauty an essential factor in all happiness? Industry can only be defeating its own ends, therefore, if it is estranged from beauty; to divorce the two is unnatural and definitely retrograde. That is why it is not only expedient for us to cherish beauty; it is a solemn duty.

The Virtue of Pride in Work.

At this time, when industry touches the lives of all of us at so many points, it is more than ever necessary that we should realize the full extent of our duty in seeking after beauty. We have seen how fatally easy it is for industrialism to produce ugliness, but we can also see that it is only carelessness and lack of pride in our work which is the cause of this. For that is the great danger with our modern mass-produced goods, that we are apt to suffer by the loss of that pride lavished by the craftsman of old on his work. It is vitally necessary to retain this pride in our creations, the pride, for instance, of the old guilds in their products. And pride is largely a matter of tradition. May I here refer to the words of Dr. Baillie, Vice-Chancellor of the University of Leeds, who, in a recent speech, said that a knowledge of the history, processes, and laws of the craft in which a man is engaged lifts his work into a wider setting, so that he acquires thereby a new sense of the place of his particular activity in life? It would be well for us if we realized more keenly the connection between ourselves and the craftsmen of the past, if we acknowledged our debt to tradition, instead of regarding ourselves as the children of a new movement, without spiritual forefathers.

Respect for Tradition.

Chief of all the qualities of the old craftsmen which we might inherit is the capacity for taking infinite pains. No work of art is produced without infinite care, and even drudgery. Leonardo da Vinci, with his mind so curiously akin to the modern, can be an inspiring example to us. For not only was he painter, engineer, builder, and inventor, but even plumber; nothing in Nature was too trivial for his notice, no branch of knowledge uninteresting. Mending the bath of Beatrice Sforza was to him a matter for as much care as modelling an equestrian statue of her husband.

Now more than ever is there need for infinite pains in our craftsmanship, for mass-production means inevitable standardization, and the producer has far more responsibility when he turns out thousands to the same mould than if only one object is made. Our standardization *must* be standardization of beauty, and not of ugliness. It is essential that manufacturers should employ the best artists. I would go so far as to say that every factory should have its chief artist, as well as its chief chemist, chief engineer, chief accountant, and chief salesman.

Mass Production and Modern Standards.

Though there is much to deplore, there is also much to show that in modern times standardization, far from making us careless, has actually raised our standards. Miss Edith Sitwell may regret that women now dress very much alike, but she cannot deny that the clothes of poor people are infinitely better than those of a generation ago; the poor woman is dressed simply and well, and her clothes are no longer a shoddy imitation of the clothes of richer women. Now that there is little scope for mere adornment, our clothes are neater and better cut; and is it not better, when our means are limited, to rely on line rather than on ornamentation?

It is a common tendency among unthinking lovers of beauty to condemn a thing as "mechanical" or "machine-made," as if the very fact of its not being hand-made were in itself an all-sufficient condemnation. If they considered the matter they would realize that we have cause to be grateful to machinery for making a high standard of beauty possible in the common things which the poorest of our people can possess—good, artistic furniture; good modern prints and reproductions of old masters; well-printed books; bright, cheerful pottery; and pleasant fabrics for clothes.

May I here mention the hopeful message of Sir William Bragg in his Address to the British Association at Glasgow this year? "Nothing that is vital and creative," he said, "need escape æsthetic control, and mass-production may be brought to satisfy the standards of ideal harmony as fully as individual craftsmanship."

The Standardization of Beauty.

Undoubtedly some of the early machine-made things were completely lacking in artistic merit; that they were also lacking in utility goes almost without saying. Birmingham poured out a flood of brazen "Oriental" atrocities, and Staffordshire did its worst in ornamental china. But happily manufacturers have realized that, as the standard of education is higher at the present day than ever before, so is the standard of taste. The cheap and ugly product no longer sells. Consequently we have our great industries seeking out the finest artists of the time to design for them. The gas industry has realized the necessity for using only the very best designs, and is proud to have obtained the advice of a President of the Royal Institute of British Architects. A beautiful thing is none the less beautiful because it is one of many equally beautiful things; rarity is a quality which appeals to the collector, but the true lover of beauty wishes to see it everywhere. Standardization means, above everything else, that beauty can be widespread and accessible, no longer the prerogative of the wealthy classes. And for that we ought to be profoundly grateful.

The Fine Tradition of British Craftsmanship.

It is easy to cast aside tradition, but it is a dangerous thing to do in our arts and crafts. For in England we have an inheritance of fine and painstaking craftsmanship which must surely be a national asset. It is the bane of much modern art that in the craze for originality all tradition is ignored, with unpleasing results. A work of art is none the less original because it owes much to preceding styles. The Houses of Parliament offer an interesting example of the perfect combination of tradition and originality; they are in detail Tudor, but in planning and conception absolutely original, and resemble no other pre-existing building. Few will deny that the result is satisfactory. Chippendale, greatest of our English cabinet-makers, was content to produce nearly all his work in the three styles of Gothic, Chinese, and Louis XV. Robert Adam, most successful and versatile of architects, confined himself almost entirely to adaptations of Roman and Italian models. And even William Morris, with his extreme desire for simplicity and originality and honest workmanship, only carried out, probably unconsciously, the Roman ideal of Stability, Utility, and Beauty.

Here in York, probably more than anywhere else in the country, we have all around us, both in our beautiful Minster and in the humbler domestic architecture of the city, evidence of the noble craftsmanship of our forefathers. And it is surely significant, and a matter for legitimate pride and hope, that in York the once powerful Guild of Merchant Adventurers has been revived and is again flourishing.

Not all of us realize that it was Britain which led the modern revival in art. In 1912 there was held in Ghent an Exhibition of British Applied Arts. This aroused such keen interest in Europe that the French Government applied to the British Government for another similar exhibition of British Art in Paris. This was arranged, and was opened in the Louvre in July, 1914. It was one of the lesser tragedies of the Great War that it eclipsed the interest in this most important exhibition. But it should be an inspiring thought for our modern British craftsmen to realize the important part that this nation has played in the revival of interest in applied arts. A notable exhibition will, in fact, be opened at the Royal Academy in a few days.

Truth in Material.

Let us then not despise tradition. By a reverence for tradition I do not mean a slavish copying of the works of our predecessors. Our own age is one in which we demand primarily that an object which is intended for use shall fulfil its function perfectly. This desire for simple suitability and *truth* in material has produced some very beautiful things. For sheer rightness of material, elimination of waste, and perfect balance of proportion it would be hard to beat the modern battleship, or locomotive, or motor-car. The result is that, in addition to their usefulness, almost, we might say, because of it, these are æsthetically satisfying things. This desire for truth and frankness in beauty, for the pure fulfilment of a need, is not essentially modern. The Greeks and the Romans had it, and much later in England, in the 18th century, we get the same hatred of decorative superfluity.

Beauty must not be an Afterthought.

Before proceeding to illustrate my theme by some details of our own industry and its work, let me pause for a moment to lay particular stress upon one fundamental; lest in treating so complex a subject in so short a time I may unintentionally mislead anyone. In my attempt to visualize the application of beauty to an industrial age I do not mean by that term what is sometimes called by artists mere "prettiness;" still less do I mean ornate design or mere meaningless decoration to cover up what is fundamentally poor in the general conception. Beauty, to fulfil its function, must be inherent in both the soul and the body of any work; as in God's handiwork, so also in man's. If beauty be an afterthought —something added, or something serving no real purpose— then the result is either the whited sepulchre or the barren fig tree; either a static thing pretending to be clean and fair when it holds within itself the elements of decay and dissolution, or a living and growing thing which puts out, as mere pretence and adornment, the covering which should shield the life-giving fruit, and which but tempts and then deceives the hungry and thirsty traveller, who approaches not merely for shelter and repose, but for nourishment and refreshment.

In short let me say once again that where there is pretence in place of truth there is no beauty. Beauty and industry, then, must be partners in the mystic sense of perfect marriage; so that the result of their union is not merely a repetition of the one or of the other, but something which is the happy product

of both—something new, something vital, something that did not exist before the partnership.

PART II.

I have tried so far to postulate, not a utilitarian idea of beauty, but a beautiful idea of utility. If this is understood, as I hope it is, I may suitably discuss the æsthetics of a great public utility—the gas industry. No one will disagree with me if I say that our industry, while its functions are utilitarian, has as its chief mission one which is fundamentally æsthetic. I must do more than make a passing reference to this mission—the abatement of smoke—if I am to show substantial reasons for regarding the functions of the gas industry as being even utilitarian.

Sunlight or Smoky Gloom?

I will approach this subject by the avenue of quotation, my authority being Sir Frank Baines, speaking as Director in H.M. Office of Works. "To-day we see the nation existing as under a cloud, raised, shall we say, by its own restless, unremitting, and brilliantly successful industrial exploits. In its great centres of population it lives in the gloom of its smoke and fogs, peering out upon Nature, inexpressibly defiled by the results of its very virtue of unceasing industry; and perhaps regretting, in its periods of quiet thought, its forfeiture of its common birthright—clear sunlight and sweet air."

Medical Officers and the Smoke Nuisance.

Dr. Osborne, the Medical Officer of Health for Salford, has recently shown, in a table comparing the bronchitis death rates for some of the more important areas in the country, that the rate for the Manchester group of towns is remarkably and consistently high, being in every case over 50 p.ct. greater than that of the country as a whole, and standing out in marked contrast to those of such areas as Birmingham, Bristol, Leicester, Bournemouth, and Eastbourne.

It is the tarry domestic smoke which puts the "bloom" upon our buildings, and which is so distressing to our architects and so injurious to our respiratory organs. The great group of towns and urban districts, of which Manchester forms the centre, constitutes, as Dr. Osborne has pointed out, "a very densely populated area, containing several millions of inhabitants, largely working class, whose hundreds of thousands of dwellings are largely provided with ordinary open fires and kitchen ranges consuming a vast amount of soft bituminous coal." Such houses, I may say, are happily decreasing in number year by year. Some municipalities are more enterprising than others in their method of tackling the smoke problem, and Manchester is one of them. The city's housing authority has experimented with grates designed for the consumption of solid smokeless fuel, and since 1922 has also installed gas fires in new dwellings.

The Responsibility of Local Authorities.

Another Medical Officer of Health, Dr. Moore, of Huddersfield, lately dealt broadly with the problem of smoke abatement at the Annual Congress of the Royal Sanitary Institute held at Plymouth. After discussing the opportunities afforded to local authorities in dealing, by education, with the open firegrate, he gave it as his opinion that there was an even greater opportunity for reducing the smoke evil where new estates are springing up, and where it is possible to introduce smokeless appliances for heating and cooking. "The gas industry," he said, "has been an enormous factor in reducing the smoke evil of great cities. Reputable British makers have caused prolonged scientific researches to be made into the whole question of gas heating, and the results are seen to-day in serviceable, scientifically constructed equipment that can be safely used without the slightest detrimental effects to health. The good modern gas fire heats adequately and assists in healthful ventilation, and for these reasons it must be given an important place in the heating arrangements of new housing schemes."

The North Sets an Example.

I think I may say that Scotland and the Northern counties are showing a remarkable example to the rest of the kingdom by their enterprise in dealing with the domestic smoke problem. In regard to old houses equipped with open firegrates and coal ranges, borough and urban councils throughout the West Riding, in the South of Yorkshire, and in the populous districts around Manchester, are urging the public to substitute smokeless fuels—solid or gaseous—for raw coal. In new housing estates provision has been made either for the encouragement of the burning of solid smokeless fuel, as in the case of Hull, or for the installation—on a scale hitherto unattempted—of gas fires, cookers, and water-heaters, or of electrical appliances in districts where the price of electricity makes it an economic alternative.

The Regional Smoke Abatement Committee of the West Riding of Yorkshire has recently invited the hundred local authorities affiliated to it to forward information showing precisely what has been done in their respective areas. This information has now been assembled in the shape of a report. The following extracts typify the vigorous policy now being pursued in the West Riding:

Leeds, 1926-27.—One thousand two hundred and fifty-one houses erected by the Corporation are provided with gas fires in all rooms except the living room, where a coal fire is provided, together with a fire-back boiler. The scullery contains a gas cooker and gas copper. Twenty-four of these houses have also secondary means of heating the water required for the bath and lavatory by gas, in addition to the fire-back boiler.

Bradford.—Five thousand houses have been erected, all of which are heated by gas, with the exception that in each house there is one coal fire in the living room.

Halifax.—Seventy-five p.ct. of houses erected by the Corporation are provided with gas cookers. Eighty p.ct. of the houses are provided with gas fires in the bedrooms. In 25 p.ct. of the houses combination stoves have been fitted which will burn either coal or coke.

I do not wish to imply that the South is behindhand in this movement. It would not be feasible to give an exhaustive account of what is being done all over the country in the equipment of new dwelling houses, of which 470,000 have been completed during the last two years alone. I am more anxious to refer to another aspect of the housing problem—the reconditioning and modernizing of older dwellings. Towards this end His Majesty's Government in 1926 promoted a Bill which was passed by Parliament and is known as the Housing (Rural Workers) Act, 1926; and a number of schemes under this Act, giving effect to the intentions which it embodied, have been submitted by Local Authorities to, and approved by, the Minister of Health. The Minister has expressed the hope that as a result many rural dwellings will be preserved in a fit condition for continued habitation, and, incidentally, that many examples of beautiful cottage architecture may be saved from premature decay.

I think we shall find it illuminating to examine some of the standards laid down in a housing manual issued by the Ministry of Health, for the guidance of local authorities, public utility societies, and private enterprise builders engaged on this work.

Housing Service.

In a preface to this book we find the Minister of Health laying great stress on the fact that much injury to the beauty of these houses and cottages will result if the work of modernizing is handled in any respect without proper care and skill. In reconditioning, gas can play an important part.

Now the Ministry of Health, if we accept the implication of its housing manual, has very definite opinions about what constitutes careful planning and appropriate design; and if a Government Department holds definite opinions about a thing, we may reasonably take it that there is fairly conclusive evidence to support those opinions. If I may be forgiven for quoting once again, I can throw significant light on the basis of the Ministry's very definite opinions. "The importance," says the manual, "of diminishing, and as soon as possible abolishing, the production of smoke from dwelling houses everywhere, but especially in large urban areas, can hardly be exaggerated. While reasonable foresight as to future developments may suggest the conservation of the chimney flue for the present, any uncertainty on that head does not justify neglect to use as far as possible the alternatives to the burning of raw coal which are already available."

The Indispensability of Gas in the Home.

This statement more or less summarizes the principles contained in several preceding sections on the heating of living rooms. In earlier sections which deal with cooking, water heating, and laundry work, the terms in which the Ministry's advice is phrased leaves no doubt at all that the experts responsible for their drafting regard the presence of a gas supply as an almost indispensable accessory.

I do not mean that in every instance the Ministry's manual actually specifies the introduction of gas appliances. I mean, rather, that the Ministry assumes the desirability of certain standards for the attainment of which the proper use of gas appliances is practically a condition precedent. To illustrate what I mean, let me refer to certain paragraphs relating to the parlour, which in my opinion are worth repeating at length.

"The advantage of a second small sitting-room needs no explanation. Many of the purposes for which a parlour is valuable can be served by quite a small room; little more, in fact, than a recess opening from the living room will do much to provide the needed retirement for reading, writing, dressmaking, and other occupations with which the general movement in the living room is liable to interfere. While, therefore, a fair-sized parlour is desirable, the benefit of quite a small room is not one to be despised.

"A third bedroom, if provided with a fire or other means of heating, may serve such purposes when not required as a sleeping room; and a little care in planning will generally ensure that one or two of the bedrooms have a comfortable corner near fire and window where an adolescent member of the family can find refuge. A parlour in like manner may serve

for a third or fourth bedroom in case of need; though it is found that a good deal of crowding in the sleeping rooms will often be endured before the conventional parlour is allowed to be invaded by a bed.

"Such interchange of uses is much more common in America, and may increase here also. Habits of life vary too much, both locally and between different sections of people, and the details of good house planning are too much dependent on them for many rules to be laid down dogmatically. Moreover, habits are changing with unusual rapidity to-day."

Gas in its Relation to House Planning.

I have quoted the Ministry's views without interpolation, but I do not intend to leave them without interpretation—an interpretation which will be reasonably clear to most people. I think I can fairly say that the gas industry has for years realized that "habits are changing with unusual rapidity," and it has contributed not a little to the change of habits. It has, for example, urged upon the people in its educational propaganda the benefits of flexibility in house heating; and everyone will realize that the availability of warmth, as and when warmth is needed, is essential if rooms are to be used in the way which the Ministry suggests. The parlour which is used for occasional retirement, "the third bedroom" which is called upon for the same purpose, the bedrooms also, if they are to be comfortable and healthy, require warmth and ventilation by some method which is not going to involve the continuous consumption of fuel. I maintain that the satisfaction of this need has been a genuine social service to the great mass of the people; for the great majority require not so much increased leisure, though that is important, as increased facilities for using that leisure in profitable and peaceful recreation. For only under conditions of peace and quiet can recreation be truly re-creation.

I have spent, perhaps, too much time on this aspect of what we are proud to call our services to the nation. But it leads me to the consideration of another, and closely allied, question—the question of how we are to relate architectural design to utilitarian design, by which I mean the design of domestic equipment. The phrase "domestic equipment" very loosely expresses what otherwise I can only describe in a long sentence, for it includes not only domestic appliances, but the whole plan or lay-out of domestic facilities. If the manager of a household does not possess these facilities of position and of accessibility for using her appliances in a utilitarian way, she cannot fairly be said to be equipped for domestic duties. How, then, is this equipment to be brought into line with architectural beauty?

Beauty in Daily Life.

One or two concrete examples of the way in which the necessary co-operation is so often lacking may be useful here—though they are very ancient history. A man and his wife decided to build a new house in the suburbs of one of our great towns. The building was nearly completed when the mistress of the house, who had not previously been consulted on any point, realized that merely knocking a door into a certain portion of the dining room wall would immensely facilitate the service of meals, and would save labour, time, and possibly many breakages of crockery. The architect, however, would hear nothing of the proposed alteration; he insisted that it would spoil his whole design, that it would be sacrilege, and that short cuts for servants could not compare for a moment in importance with his plans. Finally he gave the lady of the house to understand that she might do as she liked when he was safely out of it, but as long as he had any connection with the place there could be no such alterations, because his artistic reputation was far too precious to be sacrificed to considerations of mere utility.

A more glaring instance is that of a large public institution which was being moved from an old and cramped area to a more suitable position. The head of the institution asked that she might be taken into consultation with the architect, so that she might help him with suggestions based upon her intimate knowledge of the defects and inconveniences of the old building. Great was her disappointment when the architect, backed up by her Committee, told her she should see the plans upon their completion, and before building operations commenced, and be permitted to suggest any improvements in detail. Thereupon she said quite truly: "But that would be too late and quite useless. The points I wish to raise are fundamentals, such as the relation of the bathrooms to the bedrooms, the kitchens to the larders and pantries, the laboratories and workshops to the lecture rooms, and so on. I want to interfere even with the construction of the chimneys and fireplaces, as I do not wish to have one block of solid fuel in the building, least of all one old-fashioned coal cooking range. The whole heating and ventilation cannot be put in as an afterthought, and it is absurd that when I desire to have clean, labour-saving gas instead of coal all over the building you should not take this into account in your plans by arranging beforehand for the structure to be properly carcassed with piping and by designing the right kind of grates and chimneys from the very beginning."

That is a point of view for which the architect of the future will have to allow, and which I am glad to acknowledge the twentieth century architect is more and more considering—namely, the changing social needs of those for whom he builds, more especially perhaps for those who, because they only rent houses, are powerless to exert any direct influence on their own behalf. Here is a case in which the architect must definitely lead public opinion. He may rest assured that his reputation will be enhanced, not decreased, according as his designs combine art with utility, and beauty with common sense.

Fittings and Fitness.

I have shown that an essential part of classic design, which in its best period stands above reproach, was fitness and adaptation to the purpose required. Surely, when we come to consider the fittings of houses, as when we consider their design, beauty is of little value unless accompanied by utility.

That also is the test to apply to all designs of gas appliances, a subject which I know is going to be very fully and ably dealt with later in this Conference, and which I will only refer to briefly. Certain standard dimensions and other requirements have been laid down by the gas industry after years of research and investigation, simply and solely as securing the highest possible degree of utility and efficiency in the gas apparatus in question. Within those limits the designer has a free hand to achieve beauty and simplicity. Gas fires can be, and are, designed so as to be both useful and beautiful; in that, while serving the primary purpose of heating the dwelling and assisting in ventilation, they at the same time can be made to harmonize with any type of house from the cottage to the mansion, and with any style of interior decoration and furniture through all the periods. They are useful in that they perform the work for which they are designed with the maximum of hygiene and efficiency and with the minimum of cost.

We as an industry are proud of the fact that a President of the Royal Institute of British Architects has turned his attention to the design of gas fires. I refer to Mr. Walter Tapper, A.R.A., who, we are also proud to record, is Consulting Architect to York Minster. Twenty-five years ago we should not have thought of approaching an architect of distinction for his help in such a matter, and I dare say he, for his part, would not have cared to associate his name with mass production had we done so.

Practical Evidence from Another Industry.

Let me take an example from another industry. Only a few weeks ago a glass convention was held at Bournemouth, and the President of that convention, Mr. Walter Butterworth, said very much what I should like to say myself about mass production. To-day glass is one of the least costly of all commodities in common use. Automatic machinery is engaged in the production of glass articles at a rate hitherto undreamed of. Mr. Butterworth asked his hearers whether a mechanized industry must necessarily be void of a sense of beauty. Mass production does not necessarily involve loss of beauty. Glass of pleasing, simple lines, of good colour and translucency, can be turned out by mass production methods; and taking this as an indication, there is no reason to suppose that anything produced mechanically need be ugly. As I have said, we shall have the pleasure of hearing that subject fully discussed, and I leave it in the competent hands of Sir Lawrence Weaver to turn to a more controversial question—the question of beauty in advertisement. But before I do so I wish to say something of what we have to advertise.

Advertising Service.

Generally speaking, we are advertising service. I do not mean some nebulous philanthropic spirit which governs our dealings—though there is more philanthropic spirit in British commerce to-day than many people would suppose—but a definite policy of interest in the special circumstances of our consumers, followed by careful catering for their needs.

I call it a "policy" of interest because it is essentially a matter of good business. We hear a great deal about "service" nowadays, in many and varied branches of commerce, from motor-cars to furniture; but "service" as I understand it, means two things, both of which are quite distinguishable from the spirit of goodwill in which we hope and endeavour to do our business, and neither of which has anything to do with the "something for nothing" idea. These two things which together make up the gas industry's service are given in greater or less degree by every gas undertaking. The first is given by the gas itself; and the second is given by the representatives of a gas undertaking whose business it is to study a consumer's needs.

Personal Beauty and Health.

Gas comes into our homes, meets those needs, and enables all of us to live more fully. It does this, as I have shown, by lessening the amount of smoke, and so bringing sunshine into the home; and also by saving fatigue, by removing all the drudgery and unpleasant tasks which are inseparable from the home which relies for its fuel needs on raw coal. In the modern home, where gas is responsible for good and clean cooking, for a ready supply of hot water, for even and constant

warmth, for the destruction of refuse, and for refrigeration, who will deny that the housewife has both a pleasanter and an infinitely lighter task than the housewife of a generation ago? The influence of the greater cheerfulness and greater leisure in the home is more far-reaching than may at first sight appear. For with her greater leisure the young wife can keep her personal beauty and can also continue her intellectual interests, which were under old conditions so often allowed to lapse after marriage, because a housewife's time was wholly occupied with domestic cares. Our industry can say with justifiable pride that it is responsible for an enormous amount of happiness in the home.

PURE FOOD: THE SAFEGUARD OF REFRIGERATION.

Happiness depends as much upon health as upon leisure; and if I appear to have stressed the influence of leisure overmuch, it is because leisure is such an important contributory factor to good health. But health depends upon other factors, one of which especially I should mention at this time—the proper marketing, cooking, and storing of food. Public attention has lately been drawn, by the Ministry of Health's wise move in restricting the use of chemicals in foodstuffs, to the urgent need for proper methods of keeping food fresh.

Proper methods will only be those that threaten neither the health nor the convenience of the consumer. Chemicals admittedly threaten health; moreover they provide no reliable protection against contamination and decay. The absence of all protection, on the other hand, threatens convenience to this extent—that the housewife is obliged to purchase food supplies in relatively small quantities at short intervals, which is neither an economical nor a very practical way of marketing. The advent of an inexpensive and simple method of refrigeration enables the housewife to buy pure food and to keep it pure when bought.

The gradual revolution which gas has brought about in the home in so many ways, of which refrigeration is but the newest, has its parallel in industry.

THE AMENITIES OF THE FACTORY.

The days are passing when men and women must eat their meals where they work, in dirty and dusty surroundings. Not only are actual working conditions being made cleaner and more comfortable by the use of gas for every process in which heat is needed, but every self-respecting factory has its properly equipped canteens and lavatories. Alderman Ben Turner recently had occasion to say in an address on industrial hygiene: "I have seen a transformation, nay a revolution, in factory amenities which has helped to lengthen the lives of the industrial classes, and I hope to see more reforms, hygienic and social, before I pass by." I do not think he or any of us will be disappointed if the lessons taught—and practised—by the gas industry are assimilated by industrialists generally, and also by leaders in commerce and business.

I have barely summarized some of the services which the gas industry has to offer. My object in doing so at all has been merely to show that when we advertise gas we are advertising health, comfort, simplicity, leisure—anything but a mere commodity.

BEAUTY IN ADVERTISEMENT.

The task, therefore, or rather the duty, of producing advertisements which are not vulgar or blatant, is made, in a sense, all the easier for us. But I think we may take credit for doing something more than merely avoiding the pitfalls of vulgarity or blatancy.

The advertiser has a privilege denied to the statesman—he may go in advance of public opinion. One might almost say that he must go in advance of public opinion if he is to reap success; but he must equally go in some degree in advance of public taste. His advertisements should, and can, educate the vision as well as the mind, so that the public will accept the feeling of an advertisement as they accept its message. When this state of affairs is reached we shall be able to say with truth that advertising is an art.

I need hardly give examples of the general trend in this direction—the railway posters, the Empire Marketing Board advertisements, and so on. All I would say is that we as an industry are in sympathy with the movement, and have always been in the van of it. We shall never, I hope, be among those advertisers who "pursue us in every street and in public conveyances with information we do not want couched in visual forms which are . . . strident outrages on good taste"—to quote a writer in the "Spectator" some two years ago.

THE GAS INDUSTRY'S LEAD.

We, the gas industry united for service, were the first British industry organized on co-operative lines. We, the gas industry united for propaganda, were among the first British industries to employ the services of Royal Academicians and other artists of first rank to draw and paint for us. I am not forgetting "Bubbles," but the outcry which occurred among artists and among the public when a firm of soap manufacturers made a bold and glorious attempt to introduce art and beauty into ordinary commerce will still be fresh in the minds of some of us. Our Association, by making the employment of fine artists an article of faith and the instrument of a considered policy, did much to still the murmurings that remained, and to turn indignation into gratitude.

Our industry, again, was the first organized national industry to employ highly trained writers of university and technical standing to draft our copy, to write our articles and pamphlets, and to control that clearing house of facts relating to our part of the fuel industry which has been of such immense service both to the industry itself and also to the Press when co-ordinated information was nowhere else available.

PLANNING AND DESIGN OF SHOWROOMS.

I cannot leave the subject of taste without some reference to showroom design and architecture. It is surely the duty of every business undertaking upon which falls the responsibility of raising new buildings to see that those buildings add to, or at least do not detract from, the amenities of the locality in which each is placed. I am treating this matter as a duty, and not as a common-sense business principle, for the reason that the business aspect will be dealt with to-morrow. Regarding showroom architecture, therefore, as a duty, the gas industry has its full share of responsibility in gracing or disgracing our streets and thoroughfares.

We of the York Gas Company have tried, in designing and bringing up to date our own showrooms, which I hope you will all visit, to remember that we do our work under the shadow of York Minster, and opposite one of the most ancient churches in England.

HARMONY WITH ENVIRONMENT.

There are two main courses open to the business concern which has to raise buildings in many centres of activity. On the one hand, it may decide to adopt a standard characteristic design to be closely followed in all instances. On the other hand, it may call in the architect, whenever a new building is required, to decide what will be most appropriate, having regard to neighbouring buildings and the character of the locality.

I do not propose to discuss the *pros* and *cons* of these different policies. We, as an industry, are so constituted that the last mentioned, conscientiously pursued, must bear the most fruitful results. It would be invidious to select what I consider the best fruits already sprung from the tree. But, to point to two opposite extremes of size and style in recently opened showrooms, I would like to mention especially the simple dignity of the London Gas Light and Coke Company's showrooms in the Royal Borough of Kensington, opened by H.R.H. the Duchess of York, last year, and the homely welcome of the Tudor showroom, built like an inn, at Walton-on-the-Hill, in the area of the Redhill Gas Company, and opened a few months ago.

A VOICE IN THE WILDERNESS.

We must all feel that the present-day standing of our industry, regarded from any angle, economic or æsthetic, must, in its earliest beginnings, have been a far and faint cry. And yet there was one man, well described as the impressario of our industry, who was able to say a century and a quarter ago that "a National Concern will soon be raised to open a mine of wealth in Britain." That man, F. A. Winsor, the promoter of the first gas company, believed, in his own words, that gas would one day "cherish the soul and create good humour by uniting convenience, utility, and pleasure."

One is prompted to be a little reminiscent on these occasions, and I am the more conscious of my own limitations in this respect since we have on our Board a member whose memories must go back to a time when people could still speak of Winsor's words as we speak of what Gladstone said in 1884. Mr. James Melrose reached his 100th birthday on Aug. 5 this year; and I and all his colleagues rejoice to know that he is still alert and vigorous—doing active work on the Boards of two or three large businesses in addition to our own.

When Mr. Melrose was born, gas was a new thing. Those were the days when the Company's servants went from house to house bargaining for consumers. To-day the time has gone by when Winsor's words first came true in fact; and we and Mr. Melrose may well look forward to a future that was unimagined in his youth.

CONCLUSION.

To sum up. I hope that in the latter part of this address I have succeeded in showing you briefly what I set out to prove in the first part—namely, that we, as an industry, have a profound respect for the tradition of beauty in every-day life, and that we have always striven to live up to this tradition.

We do not claim that our industry has never been guilty of shortcomings in design and execution; we realize quite clearly that some of the early gas fires and other appliances were far from beautiful; that perhaps some of our advertising of a quarter of a century ago left much to be desired; that many of our showrooms were such as no reputable architect would consider models. But we have tried zealously in the last few years to undo the errors of the past, and to lay sound foundations for the future.

The present state of affairs has not been reached without

steady work, not only by our Association, but by all the organizations within the industry. We have employed, throughout the century and a quarter of our existence, the foremost engineers and men of business; in steadily increasing measure we have also, of late years, enlisted the help and advice of the best architects and designers, the best artists and writers, the best salesmen and service staff.

We have tried to give to everyone connected with this industry, in all its branches, a sense of tradition, a sense of responsibility and duty, and a sense of the extreme importance of his special task in the general scheme. That knowledge cannot be picked up casually; it can be given, I think, only by training and education, and we do claim that ours is among the foremost industries to give special attention to this matter of staff training. So far as this Association is concerned, we have endeavoured to train our salesmen both in the underlying science and art upon which our business is built, and also in the ethics of business relationships with those whom they serve—their employers on the one hand and the public on the other. That is our considered policy.

Our great ideal is the service of the community, and to realize that ideal we have put both science and art under contribution. It is our belief that we have played—and have still to play—a not insignificant part in making the world a happier and a more beautiful place. For though in this address I have dwelt at some length on the achievements of the gas industry—achievements of which we may well be proud—yet I do not want you to think that there is little left to do. Each of our conferences is in its way a milestone on the road towards that ideal of which I have just spoken; and, like all milestones, it must mark the miles yet to be undertaken, as well as those which are passed. In these annual conferences we take stock just as much of ideas as of finance; and though it is necessary to review the past, it is even more necessary to look towards the future.

The mediæval pilgrims to Canterbury had achieved their goal when they reached that city; for you modern pilgrims to York there is no such finality about your brief visit. But I hope that the three days to be spent in meeting and deliberating with your fellow members, in this our beautiful city, will inspire you to go forward with renewed hope and confidence on yet another stage of your journey towards a noble ideal.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

212TH QUARTERLY MEETING.

The Manchester District Institution held a highly successful meeting on Wednesday last in Manchester, under the Presidency of Mr. R. H. Ginman, Engineer and Manager of the Leek Gas Undertaking. In the morning they were guests at the works of Messrs. R. & J. Dempster, who subsequently entertained them to lunch. In the afternoon a business meeting took place, when Mr. William Buckley, of the Droylsden Works of the Manchester Corporation, read a paper on the maintenance costs of vertical retorts (see p. 268).

MESSRS. R. & J. DEMPSTER, LTD.

In 1885 Mr. Robert and Mr. John Dempster transferred their business from Yorkshire to Gas Plant Works, Manchester, where extensions have continually been made to cope with a steady increase in business. The all-embracing name of the works is by no means belied by the activities carried on there, for every kind of gas-works plant is turned out by the firm, and many other plants as well. In the latter category may be mentioned apparatus for the manufacture of hydrogen for airships and a variety of welding plants. A Dempster welding plant was used for the last water main from Thirlmere to the Manchester reservoirs. Employment for 500 is found at the Miles Platting works, and there is an outside staff—for inspecting, erecting, &c.—of some 300.

Messrs. R. & J. Dempster were among the pioneers of the spiral guided holder; and examples of their work are to be seen all over the world. The Belfast holder, completed in 1923, is the largest spiral one yet erected; but there is no falling-off in the popularity of this type, as witness an order which the firm have received for a 5-million holder and steel tank at Leicester.

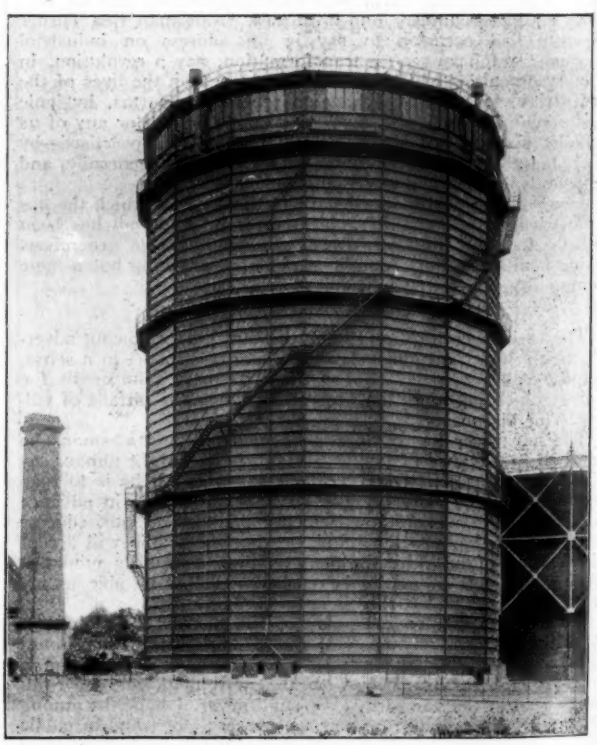
The main object of last Wednesday's visit was, however, to inspect the machinery and methods employed in the manufacture of waterless holders of the "M.A.N." type, for which Messrs. R. & J. Dempster are licensed contractors, being associated in the Waterless Gasholder Company, Ltd., with Messrs. Robert Dempster, of Elland, Messrs. Clayton, of Leeds, and Messrs. Cockey, of Frome. Of this type of holder there are now no fewer than 167 in operation or on order, representing storage capacity of over 456 million c.ft. The following orders are now being dealt with at Miles Platting

Southall, Gas Light Company	8 millions
Bradford Road, Manchester	5 ,,
Kensal Green, Gas Light Company	4½ ,,
Brentford, Gas Light Company	3 ,,
North Shore, Australia	2½ ,,
Perth, ,,	2 ,,
Brighton, ,,	100,000 c.ft.

A description of the waterless gasholder plant, extracted from a brochure prepared for the occasion, is appended to this report; but it should be said that there was much else of interest to be seen. The visitors to the number of nearly 150, who had arrived from the Town Hall Square by motor coach, made a complete tour of the works under the guidance of the Heads of Staff, and evinced the keenest interest in the wonderful array of single and multiple machines for every purpose. The foundry work, too, came in for much favourable comment. Among the big jobs which were seen in hand was a battery of 20 water-cooled condensers being constructed for the South Metropolitan Gas Company to their own design, and the erection of two sides of the vast polygonal gallery which will surround the 8-million waterless holder at Southall.

LUNCHEON.

The visitors were then conveyed to the Midland Hotel, where they were the guests at luncheon of the Chairman (Mr. Charles Dempster) and Directors of Messrs. R. & J. Dempster, Ltd. Mr. R. H. Ginman, the President of the Institution, took the Chair, supported by Mr. Charles Dempster (Chairman of Messrs. R. & J. Dempster, Ltd.), Alderman Cook (Chairman of the Manchester Gas Committee), Mr. J. Winson Scott, and Mr. H. S. Knight (General Manager of Messrs. Dempster's), Alderman Brewster, of Stockport, and the Vice-Presidents and Committee of the Institution.



The 1-Million Holder erected by Messrs. R. & J. Dempster for the Gas Light and Coke Company at Woodford.

The toast of "The King, the Duke of Lancaster," having been honoured,

Mr. R. H. Ginman said he was very pleased that the efforts of the Secretary and the Council in arranging the visit had been rewarded by an attendance of upwards of 150. They must not separate without expressing their appreciation of the hospitality which had been shown, and he therefore asked Mr. McLusky to propose a vote of thanks to their hosts.

Mr. W. B. McLusky (Senior Vice-President) said the visit would

be a memorable one. It had helped to impress upon his mind the necessity for co-operation in the industry. A firm like Messrs. R. & J. Dempster should not be in the position of having to put down very expensive plant before their order book was full. He believed that the manufacturers of plant and constructional engineers were in need of work, and the gas companies and corporations were holding back, thus intensifying the depression in trade. In Halifax they regarded the Manchester District as their home; and he considered that they belonged to the finest provincial organization of gas engineers in the world.

Mr. W. M. CARR (Stretford), seconding the vote, said that the visitors had greatly appreciated the opportunity of seeing in detail the construction of the waterless gasholder, which might revolutionize their ideas regarding gas storage. He agreed that co-operation was needed in the industry, and he hoped the day was not far distant when the Institution would include in its membership all engineers, whether on the constructional side or on the manufacturing side. This would facilitate the exchange of ideas between them and further the interests of the profession.

Mr. CHARLES DEMPSTER (Chairman of Messrs. R. & J. Dempster), in reply, stated his view that to go through anybody's works had an educational effect. It was a pleasure to welcome so many visitors who were associated with the gas industry, and therefore interested in the machinery which had been recently put down. The name of Dempster had been connected with the gas industry since 1854. To-day the works, if not absolutely the most modern in the British Isles, was well up to date. ["Hear, hear."] The visitors had seen a machine which, so far as one could foresee, would never be repeated. There was one example in Germany, another in America, a third in Manchester, and he did not think it would pay anybody in the future to go to the expense of putting down a similar machine. At the works they had a happy staff, who pulled together; and much of the success of the business was due to Mr. Scott and other members of the staff.

Mr. H. S. KNIGHT considered it would be an undoubted advantage to the industry if the constructional and gas manufacturing sides united in one body. In their own firm the heads of departments who were responsible to the Board of Directors held a position similar to that occupied by gas engineers and managers in relation to the companies or committees they served. Before Mr. Scott and he could recommend the Directors to undertake the outlay required for the manufacture of waterless gasholders, they had to give the matter much careful thought, until they became pretty certain that this type, or what would arise out of it, would be the gasholder of the future. Mr. Scott and some colleagues went to Germany and carefully inspected the plant there. After they had reported, Mr. Dempster and he (Mr. Knight) went over and made a further investigation before deciding that if the firm was to keep at the front in gasholder construction it was necessary to take hold of this manufacture with a firm hand. Credit was due to the foresight of Mr. Charles Dempster and his willingness to make a bold plunge. He gave them a free hand. In effect, he said, "Put down the whole of the machinery, so that we can produce and finish the waterless gasholder from beginning to end." This they had done. The gasholder would be made of British material, by British workmen, erected by British labour, developed (it was hoped) by British brains. In order to develop it they wanted the co-operation of every gas engineer in the country. They much appreciated the kind remarks which had been made. They wanted orders; but they did not ask for favours. They liked to meet their friends and say, "We have something which it is worth your while to consider. Look into it; and give us a trial. We will not let you down if we can possibly help it." In that spirit they welcomed the visit; and if anyone present would take the trouble to come again to the works, he could have a more detailed explanation than it had been possible to give that morning. Mr. Scott was a very old friend without whose co-operation he could not have carried on as he had done, and in whose company he had a very happy time meeting gas engineers.

Mr. J. WINSON SCOTT said it gave him great pleasure to associate himself with many old friends in congratulating Mr. Ginman, whom he had known for more years than he cared to recollect, upon occupying the presidential chair.

Mr. W. M. MASON (Manager of the "B.C.G.A."), called upon for some remarks, said a personality was a great asset to any concern which did business with the general public; and Mr. Scott, with his charm, tact, and knack of making friends, was a remarkable illustration of the fact. They were meeting that day as friends of the firm and co-operators. In the past one of the big temptations of people in the gas industry had been to go in for cheap and shoddy plant; but people had now come to the conclusion that the right policy was to get the best article which it was possible to have. The capacity to produce such an article was a big asset for a firm like R. & J. Dempster, Ltd.

BUSINESS MEETING.

At the business meeting which followed the luncheon, Mr. R. H. Ginman presided. In opening the proceedings he referred to the loss sustained by the Institution in losing through death two of the old members. Mr. Samuel Shadbolt joined it in 1911, and had been President of the North of England Gas Managers' Association. Mr. Meunier became a member in 1896, was President in 1905, and was awarded the H. E. Jones Gold Medal in 1913. He founded the Commercial Section. As a member he did considerably more than many for the cause of the gas engineer's profession and of the gas industry. ["Hear, hear."] With these two names he associated the name of Mr. A. F. Bezant, Editor of the "GAS JOURNAL," whose pen had flowed freely in the cause of the industry.

The following new members were then introduced: Mr. J. P. Thompson, Engineer and Manager, Barnoldswick; Mr. J. Robinshaw, Manager and Secretary, Westhoughton; and Mr. G. Briggs, Manager, Knutsford.

EDUCATION CERTIFICATES.

The PRESIDENT then presented Higher Grade Certificates under the Education Scheme to the following successful students in Gas Engineering. Nearly all were present, and received the President's congratulation amid applause:

W. C. Barrow, Frodsham.	J. J. Brown, Liverpool.
K. E. B. Brown, Morecambe.	J. H. Daniels, Wallasey.
P. Gallagher, Atherton.	R. W. Harris, Clitheroe.
C. Johnson, Liverpool.	J. G. Pope, Altrincham.
J. Roberts, Bingley.	A. G. Saunders, Runcorn.
J. Powdrill, Oswaldtwistle.	J. B. Walsh, Altrincham.
G. W. Wilcock, Manchester.	E. Williams, Ormskirk.

MAINTENANCE COSTS OF VERTICAL RETORTS.

A paper on the above subject was then read by Mr. WILLIAM BUCKLEY, of the Droylsden Works of the Manchester Corporation Gas Department. This, together with a report of the discussion, is printed on a later page of this issue.

ELECTION OF OFFICERS.

The nominations for office were unopposed, except that for the three vacancies on the Committee there were six nominees. After a ballot vote had been taken the President announced the following as officers for the coming year:

President: Mr. W. B. McLusky (Halifax).

Vice-Presidents: Mr. W. J. Smith (Bolton) and Mr. W. M. Carr (Stretford).

Hon. Secretary and Treasurer: Mr. J. Bridge (Elland).

Committee: Mr. J. E. Lister Cooper (Yeadon), Mr. F. G. Shaw (Buxton), and Mr. W. Rogerson (Middleton).

Auditors: Mr. William Hill (Stalybridge) and Mr. Francis Elliott (Leyland).

Mr. W. B. MCLUSKY thanked the members for electing him, and promised to do his best to maintain the traditions of the office; and Mr. W. M. CARR also acknowledged his election.

MR. ROGERSON RESIGNS THE SECRETARYSHIP.

The PRESIDENT remarked that in February next Mr. Rogerson would have filled the office of Secretary and Treasurer for eight years. They were all grateful to him for his services; and they felt sure that Mr. Bridge would be a worthy successor.

Mr. G. S. FRITH (Runcorn) mentioned that Mrs. Rogerson had had to undergo an operation and was now in a nursing home. On behalf of the members he offered to Mr. Rogerson their sincere sympathy, and hoped that he would speedily get to the end of his troubles. His eight years' service had included the period of the coal stoppage; and he had well deserved their thanks.

A vote of thanks to the President, Officers, and Committee was proposed by Mr. A. L. JENNINGS (Spenborough), seconded by Mr. H. R. S. WILLIAMS (Altrincham), and carried unanimously.

WATERLESS GASHOLDER PLANT AND MATERIAL.

The plates are of a quality manufactured specially for the waterless holders, and are known as double annealed Siemens-Martin steel plates. By the double annealing they are rendered suitable for bending without fracture, and equal in ductility to plates having a lower tensile strength of (say) 24 to 28 tons per sq. in.

To ensure a perfectly flat surface, free from any trace of buckle, the plates are taken through a 7-roller mangle machine, where any defect is eliminated and a perfectly level surface obtained. After the plates have been levelled, they are taken in batches to the drilling machines, where the rivet holes are drilled from prepared templates, by Asquith high-speed drills operated by 10-H.P. motors. Every rivet hole in each side plate is drilled, and during erection reamered out to ensure perfect accuracy.

After being drilled, the plates are sheared to their approximate dimensions by means of a guillotine machine designed and built by R. & J. Dempster, Ltd., for their own particular class of work. It will shear plates up to $\frac{1}{2}$ in. thick. Thereafter the plates are taken in batches to a planer where the edges are machined to the correct size.

COLD BENDING MACHINE.

In the new "waterless bay" is the bending machine—the third of its kind in the world—which experience in Germany and America has shown to be desirable for cold-bending the shell plates and parts for piston and roof. [A photograph of the machine was given on p. 1021 of the "JOURNAL" for June 27 last.] The machine was made by the M.A.N. Company, of Germany, specially for Messrs. R. & J. Dempster, and will bend plates 30 ft. long by $\frac{5}{16}$ in. thick.

The plate is placed in correct position by control gauges, all the work necessary on the plate—such as levelling, planing, drilling, &c.—having been previously carried out. The initial pressure is applied by pressing a gripping motor push, which

operates a 4½-h.p. electric motor controlling the counterbalance levers and uprights. The amount of pressure applied is regulated by means of limit switches, the final grip being applied by compressed air. The movement of the lever applying this grip uncovers the bending control buttons, thus ensuring that no bending can take place until the plate is subjected to the maximum grip. The power for bending is supplied by means of a 45-h.p. motor, which is also operated by a push button and controlled by limit switches.

When the maximum bend is reached, the limit switch comes into operation and reverses the motor. The bending being completed, the air valve is opened, which automatically seals the bending control button and uncovers the gripping release button, which is then pressed and releases the plate, enabling it to be withdrawn from the machine. Incidentally, bending can be stopped instantly at any position by means of a safety push button. All electrical work is controlled through interlocked contacts which prevent any error. Ball bearings and gauging holes are fitted to the table of the bending machine, so that the largest plates are easily moved and set by hand. A similar provision is also made on the special bogey which was in front of the machine, thus facilitating the reversing of the plate after the first flange has been turned.

Five-Cutter Milling Machine.

The milling machine was made by Messrs. J. Hetherington & Sons, Ltd., of Manchester, to the design of R. & J. Dempster, Ltd., in preference to purchasing a similar machine from abroad. It is a distinct advance on the German machine in being able to mill 30 ft. lengths in one setting. [This machine also was illustrated on p. 1021 of the "Journal" for June 27.]

This is an important unit in the construction of waterless holders, as by it the angle of the polygon forming the holder and the thickness of the stanchion plate is controlled, the milled flats being riveted to the stanchions to take the holder side plates. The machine is capable of milling five surfaces at one setting; there being two headstocks, the first one having two cutters, which are accurately set to the angle required for the polygon. After traversing from the first headstock to the one on the opposite side, the second battery of three cutters comes into operation for milling the two outside edges and the top of the flat where necessary. The machine is operated by a 35-h.p. motor.

Stanchions, &c., for Waterless Gasholders.

The stanchions, or vertical posts of waterless holders, are composed of a built-up section according to the size of the holder. For the 8-million holder for Southall, the stanchions consist of a 10 in. by 5 in. by 30 lbs. R.S.J. with a 7½ in. by ½ in. outer flange plate, and four 6½ in. by ¼ in. web stiffening plates to upwards of one-third of the total height. They are also further stiffened by a 9 in. by ⅞ in. inner flange plate which is specially milled to the required angle of the polygon to receive the side plating of the holder, and also to act as a good face for the rolls of the piston. A base of substantial design is securely riveted to the stanchion.

The rubbing plate and tar seal were shown by large-scale drawings. The sealing fabric holding the tar is clamped to the inside surface of the rubbing plate with small steel clips. This plate is sufficiently flexible to allow it to move freely if there is any expansion or contraction in the side plates of the holder. Levers and weights keep the rubbing plates pressed against the side plates, thereby preventing loss of the sealing tar or escape of gas.

Patent Erecting Methods.

When the bottom of a holder is completed, two rows of side plates are fixed to the lower ends of the stanchions, after which the piston and roof are constructed together with the erecting cages, winches, and operating cranes, which are fixed upon the roof. The piston is then raised by air as each row of side plates is fixed, carrying with it the roof, cranes, cages, and workmen; and although this is done without any seal other than the fabric, yet there is very little loss of air by leakage. When the upper row of side plates is fixed, the roof is secured to the top of the stanchions. The piston, roof, &c., after each raising, are supported by powerful hangers, attached to the stanchions. [These suspension hangers, designed to carry upwards of 50 tons, together with a set of erection cages, were on exhibition; the hangers, on which so much depends, being of remarkably fine material and workmanship.]

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

AUTUMN MEETING IN LONDON.

The Autumn Meeting of the Association was held last Thursday afternoon at the Holborn Restaurant, London, W.C.—Mr. J. B. Hansford, of Bedford (the President), in the chair. A cordial welcome was extended by the President to Mr. John Terrace, the President of The Institution of Gas Engineers. The minutes of the last meeting were taken as read and confirmed.

The Hon. Secretary (Mr. E. F. Keable) remarked that since their last meeting a Past-President, Mr. J. S. Dougall, had passed away, and in the name of the members he had conveyed the sympathy of the Association to the family. A wreath was sent, and acknowledgment of his action was received. Also the two technical papers to which they owed so much had lost their Editors.

As a token of respect, the members stood silently in their places.

A Benevolent Fund.

The Hon. Secretary reported that he had received a letter from their good friend Mr. W. Jones enclosing a further cheque for £20, to be added to the sum of £50 which he had already given for the Benevolent Fund which had been formed in the name of the Association. The Committee had asked him to invest this additional sum, along with the amount already standing to the credit of the Association. He had addressed a suitable letter of thanks to Mr. Jones.

New Associate Member.

The President intimated that the Committee had had before them, and had duly passed, a proposal that Mr. P. K. Banks, of Stamford, Joint Managing Director of Messrs. Williamson Cliff, Ltd., be admitted as an associate member.

This was agreed to, on the motion of Mr. A. Gregory (Harwich), seconded by Mr. W. H. Mainwaring (Lincoln).

Presentation of Certificate.

The President next presented to Mr. C. E. Smith, of Retford, the certificate gained by him in the recent Higher Grade Examination in Gas Engineering.

Papers on Control.

Dr. J. G. Stewart read a paper on "The Control of Calorific Value;" and he was followed by Mr. Ronald B. Glover, who dealt with the subject of "Technical Control in the Retort House."

These, with reports of the discussions to which they gave rise, will be found on later pages of this issue.

Mr. Thomas Glover (Norwich), proposing a vote of thanks to the authors, said they had dealt with subjects which were kindred; but there was a difference between them. The control of calorific value might be accomplished outside the retort house, by the better diffusion of gases, which could be brought about by the use of two holders—working into one, and passing the gas into another holder which was lighter, but still heavy enough for distribution. He had recently seen ideal charts taken under such conditions. Although the calorific value was not closely controlled from the retort house, it was controlled in this way before it reached the consumers, who were given perfect satisfaction. He would like to commend this idea to gas managers in the eastern counties. There were not many of them who had not two holders. He himself at the present moment had charge of a works which possessed only one. Some day he hoped to get another, because one could not possibly control the calorific value satisfactorily to the consumer with one holder—that was to say, making gas into the holder, and passing it directly on to the district. The method he had just suggested was well worth attention. It had been touched upon by one of the readers of the papers, and he thought he might have the permission of the members to enlarge somewhat upon it. There was just one other sort which occurred to him. It was possible to work horizontal retorts in equilibrium—that was without seals—by perfect retort house governing, but it must not be far away from the point at which one desired control exercised. It must not be at the condensers, for instance, but as near to the retorts as possible. Under these conditions it was feasible, with accurate gauges registering 100th of an inch, to have such perfect equilibrium that one could get the inerts down to 10 or 12 p.ct., and obtain the maximum results from the retorts, because there was only the pressure given by the skin friction of the ascension pipes. In the case of vertical retorts, they were, of course, doing it all the time. The two papers would be extremely useful, and they must feel very grateful to the authors for contributing them. They must also feel deep appreciation of the fact that they had in their midst a gentleman who was working out accurate instruments for their use. ["Hear, hear."] He believed they could claim him as an

Eastern Counties man, as he was at Letchworth, where doubtless he would welcome them at any time they might want to know more about the construction and working of his instruments. The other gentleman was, he thought, from Manchester—[Laughter]; but he (Mr. Glover) was responsible for getting him to come to the meeting, so he might be excused if he did not say much in his favour.

Mr. P. D. Walmsley (Great Yarmouth) seconded the vote of thanks, which was carried with applause.

Representative on Institution Council.

Mr. R. Wardell (Peterborough) proposed that the President be elected to be their representative on the Council of The Institution of Gas Engineers. He remarked that in Mr. Hansford they had an excellent President. Those of them who had served with him on the Committee knew this full well.

Mr. C. G. Grimwood (Sudbury) seconded the motion, which was agreed to.

New Office Bearers

Mr. Frank Prentice (Ipswich) proposed, as President for the ensuing year, their friend Mr. H. C. Smith, of Tottenham. He remarked that he could say very little which would add to the appreciation they all felt that Mr. Smith should have accepted this position. They had had some very good presidents in the past, and they were fortunate now in having Mr. Smith for the future. He might be described as one of the young bloods who were stirring-up the old bloods, with considerable advantage to the industry. They were lucky indeed to have as their President a young man who promised to take a very advanced position in the industry.

Mr. J. W. Auchterlonie (Cambridge) said he had much pleasure in seconding the proposition. As Mr. Prentice had said, Mr. Smith was one of their active, energetic, and capable young men. He had a good many irons in the fire, being on various Committees, and filling the position of Hon. Secretary to the Southern Association; but it was usually the man that was most busy who found time to undertake still further duties. This might possibly be described as his canter over the Eastern Counties course, preparatory to taking the Derby course of the Institution. [Applause.]

Mr. H. C. Smith, in acknowledgment, said he was fully conscious of the honour they had done him in electing him President, and he could only promise to do everything possible to further the interests of the Association. Mr. Prentice had endeavoured to tell them something about him, but he hoped things might not be as bad as they might imagine from what Mr. Prentice had said. One other matter he would like to mention was the place of the next meeting. His Chairman, Mr. Henry Woodall, who was no stranger to any of them, as the Association had accepted the hospitality of one or other of his Companies on several occasions in the past, had very kindly come along (as he knew, at some personal convenience) to give them an invitation.

Mr. Henry Woodall remarked that at Tottenham they were distinctly proud to think that the Association had chosen Mr. Smith as their next President. Mr. Smith was to be greatly congratulated on an honour which he (Mr. Woodall) felt sure was fully merited. As the Association had done him this honour, the Company on their part would like to show that they appreciated it, and they would be very happy indeed if the members would visit Tottenham for their next meeting. They would find the warmest of welcomes there.

The President acknowledged the invitation so kindly extended.

Mr. W. W. Townsend (Colchester) proposed that Mr. A. Gregory, of Harwich, be Vice-President for the coming year. He said it was very fitting that he should put this motion before the meeting, because he had known Mr. Gregory personally for about a quarter-of-a-century, and was sure that he would worthily maintain the prestige of the office and do his utmost to forward the interests of the Association.

Mr. R. J. Milbourne (Lillieshall), in seconding, remarked that they could not select a more eligible member.

Mr. Gregory suitably acknowledged the appointment.

The members of Committee appointed were Mr. W. H. Mainwaring, of Lincoln, and Mr. J. Green, of Wisbech. The President, proposing this, said that Mr. Mainwaring made an excellent member, and had kindly consented to act for another year.

On the proposition of Mr. Mainwaring, the Auditors (Messrs. G. A. Mallett, of Ipswich, and W. S. Venner, of Brentwood) were re-appointed, and thanked for their services during the past year.

Proposed by the President, and seconded by Mr. Smith, Mr. E. F. Keable was re-elected Secretary and Treasurer; his good work in this position being remarked upon.

The new President was introduced to the members; and before separating, those present took tea together.

THE CONTROL OF CALORIFIC VALUE.

By J. G. Stewart, D.Sc.

[Paper before the Eastern Counties Gas Managers' Association on Oct. 18.]

There is still a great need for a more constant calorific value and a closer approach to the declared value in many gas-works, particularly the smaller ones. The slow progress is usually due to the difficulty in making the average workman realize that fluctuations of 10, 50, sometimes over 100, B.Th.U. per c.ft. are equivalent to a very big loss to the gas company, and also a big loss to the consumer, who cannot get satisfaction from a fluctuating calorific value, and consequently wastes a considerable proportion of his gas. If the workman realized that an excess of 10 B.Th.U. means 2 p.ct. less volume and represents a big part of the profits of the company, he might take an increased interest in control. Sometimes he is not to blame; the holders may be too small for effective mixing, or the procedure for controlling the vacuum in the retorts may not be the one best suited to the conditions. Very frequently there is no gauge which can tell him with sufficient sensitiveness the vacuum in the retorts; and often there is no calorimeter except that on the town gas.

In this paper I shall give a brief discussion of the methods of controlling calorific value; and subsequently I shall give a description of apparatus which does the work automatically, and show records of calorific value taken with the apparatus in use.

Overdrawing.

Overdrawing is the method of control of C.V. most commonly used. The retort house governor, or the exhauster governor, may be adjusted to produce a vacuum which is constant during the whole period of carbonization and is only readjusted if the calorific value of the gas becomes too low. Fig. 7 shows a record of C.V. taken under these conditions.

This method of control does not take into consideration the fact that leakage of gases from the retort is greatest during the early stages of carbonization, or the objection to drawing hot gases into the ascension pipes when the charge is nearly spent. As leakage does not show itself, and can only be detected by very careful measurements, it is too often neglected. Some striking leakage figures were recently given by Mr. Hollings, of the Gas Light and Coke Company, in his paper, "Some Applications of Chemistry in Gas-Making," before The Institution of Gas Engineers at their Cardiff meeting. He found leakages through the retorts of 5 to 10 p.ct. of the gas made; and Dr. Parker confirmed these figures. Leakage was greatest during the early stages of carbonization. In works which have not the same facilities for testing the tightness of their retorts as have the Gas Light and Coke Company, the leakages are probably much greater. As far as leakage is due to pressure in the retort, in excess of that in the furnace, causing a flow through holes or channels in the retort walls, it may be prevented by an increased vacuum; but if the retorts are in a bad condition, the adjustment of the vacuum is a very delicate matter—a change of water gauge of a few hundredths of an inch causing a large change in the leakage or the flow of inerts.

It is probable that a proportion of the leakage is due to diffusion, as distinct from mass flow through holes and channels. The rate of diffusion of any gas varies directly as the pressure difference of that gas on the two sides of the wall, directly as the square root of the absolute temperature, and inversely as the square root of the molecular weight. In the case of a gas with 50 p.ct. hydrogen, the pressure difference is very high and the molecular weight low, so that the loss of hydrogen by diffusion would be large. As the diffusion laws are known, it is possible to estimate the diffusion loss in a retort from laboratory tests made at room temperature. Diffusion differs from mass flow through holes in this respect that mass flow can be controlled by the vacuum in the retort; but, with working vacuums, diffusion cannot.

While an increased vacuum will diminish leakage, the inerts drawn in may unfavourably combine with the gas or tar. A leak of air at a mouthpiece is harmful. The oxygen burns in the gas, producing a hot ascension pipe; or it may oxidize the tar and cause a stopped pipe.

Furnace gases drawn through the retort walls are not necessarily harmful. At a place far enough away from the ascension pipe the CO_2 and oxygen will unite with the incandescent coke, producing carbon monoxide. The oxygen will initially unite with the hydrogen, and subsequently the steam so formed

will react with the coke as in a water gas plant, if the temperature of the coke is sufficiently high. It is probable that the temperature is too low during the early stages of carbonization. Near the ascension pipe the water gas reaction may fail to take place, as the steam formed may be swept out of the retort before it has time to react with the coke.

When the charge is nearly spent, there is an objection to the drawing-in of furnace gases, because, with the higher temperature, they cause heating of the ascension pipe. From these considerations one concludes that it is advisable to vary the vacuum during the period of carbonization, making it greater during the early stages, with the exception of a short period at the beginning while the charge is at too low a temperature for the water gas reaction.

Dilution with Water Gas.

The calorific value may also be controlled by diluting the products of distillation with water gas or other low calorific value gas. In conjunction with horizontals, the water gas is made in a separate plant, and the diluting gas is added at the inlet of the exhauster. This method of control is an ideal one on works large enough to keep a water gas plant in continuous use. The problem of control of calorific value is then the mechanical one of mixing. The vacuum in the retorts can then be adjusted for efficiency of distillation without regard to calorific value. In verticals, control of calorific value by varying the steaming is control by dilution with water gas.

Hand control on these lines is expensive because it demands close attention by highly skilled men. In small works fine control is practically impossible, because the men in charge have many other things to do, and cannot be continually watching the fluctuations of calorific value. These considerations have made many engineers interested in the possibility of substituting automatic control for hand control. Apparatus for controlling the vacuum by automatically loading the exhauster governor has been in use for some time. Where retort house governors are used, the method of loading would be the same; but where more than one governor is used, each should be controlled independently of the others; a small pump to suck gas from the foul main to supply each controller would be necessary.

Automatic mixing of water gas and retort gas is not yet in operation, but probably will be very soon. In the absence of results from gas-works, a laboratory test of the method which I favour has been made, and chart records are given below of the results obtained. Automatic control of verticals has not been attempted; continuous operation makes hand control easier than in the case of horizontals, and it would appear that there is not the same interest in automatic control.

Automatic Control at Weston-super-Mare.

The Weston-super-Mare Gas Company were the first to attempt the automatic control of the vacuum in their retorts. The suggestion that the relay valve described below should be used to load the governor of the exhauster came from Mr. Taylor, the Engineer. A proposal for water loading was put before Mr. Taylor, and subsequently put into action. As one would expect, a considerable amount of experimenting was necessary before the apparatus was properly understood, for which work I particularly wish to thank Mr. Malsbury, B.Sc., the Chief Chemist at Weston-super-Mare. In November last he read a short paper to the Western Junior Gas Association (see "Gas Journal," Vol. 180, p. 617) on the apparatus used, and gave chart records showing results. The records now produced are an improvement in control compared with those shown by him. For permission to use these I am indebted to Mr. Taylor.

At Weston-super-Mare there are no retort house governors, and no seals, and consequently the water load on the governor regulates the vacuum in the retorts. An essential part of the apparatus is a relay valve attached directly to the expansion tubes of a "Sigma" recording calorimeter. This valve is shown in section in fig. 1. The valve A is operated by a lever

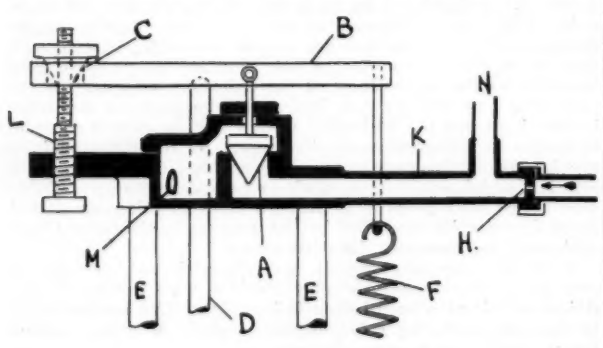


Fig. 1.—Relay Valve.

B, which itself is moved about its fulcrum point C by the expansion of the hot tube acting through two push rods D. The valve box is positioned by three rods E which fix it to the comparison tube surrounding the hot expansion tube. The motion between the valve and the seating is therefore proportional to the motion of the pen on the chart, which is a magnification of the relative motion between the two tubes. By thus fixing the valve and valve box to the tubes, there are no strains on the pen mechanism. The lever B is held against the push rods by the spring F. The relay valve is supplied with gas through an orifice H at a supply pressure of approximately 3 in. W.G. The pressure in the tube K between the orifice and the valve varies with the leak past the valve. There is generally a small leak, so that the pressure seldom equals the supply pressure. When the valve opens by a rise of C.V. of the gas, the pressure falls, thus giving the relation between calorific value and gas pressure shown in fig. 2. Adjustment of the

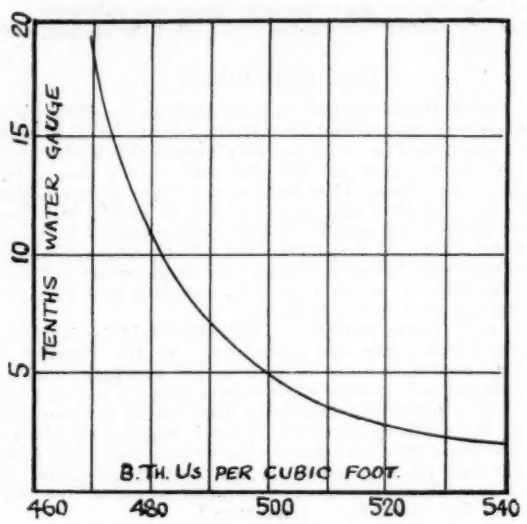


Fig. 2.—Pressures Produced by Relay Valve.

C.V. at which the relay valve comes into action is made by the screw L, which moves the fulcrum of the lever. The gas which passes the relay valve escapes through the opening M to a waste burner.

Having obtained a gas pressure variable with the calorific value, that gas pressure is used to open a water valve, fig. 3,

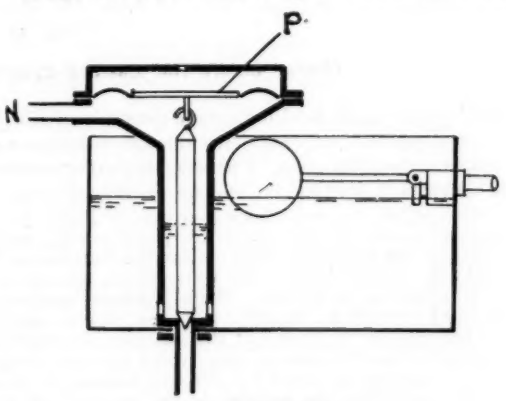


Fig. 3.—Water Valve.

the connection being made by the tube N, figs. 1, 2, and 3. At Weston-super-Mare the water valve is suspended from a diaphragm. The gas acts on the under side of the diaphragm P, and the valve is placed in a water tank, the water acting as a gas seal. When the gas pressure at the relay valve rises to approximately 1 in. W.G., the valve is lifted and allows water to flow from the tank to the governor of the exhauster, which has a small container on top of it to hold the water, fig. 4. Water flows out of the container more slowly than it flows in, so that the water level rises when water is supplied to it, and falls when the supply is stopped. It is necessary to have, in addition, an overflow tube, to limit the maximum water load on the governor. The general scheme of the apparatus is shown in fig. 4.

Automatic Control of Exhauster Speed.

In automatic control of the exhauster speed, the friction of the exhauster governor and its steam valve must be made as small as possible; and if the motion of its bell is damped, the damping must be diminished until the bell shows the pulses of pressure in the foul main. Another factor of importance is the delay between an adjustment of vacuum and the time it

takes the modified gas to reach the calorimeter; and there is a further delay while the calorimeter moves to its new reading. These delays tend to introduce hunting—that is, the calorimeter does not settle down to a steady reading, but fluctuates about a mid position. By reducing the difference between

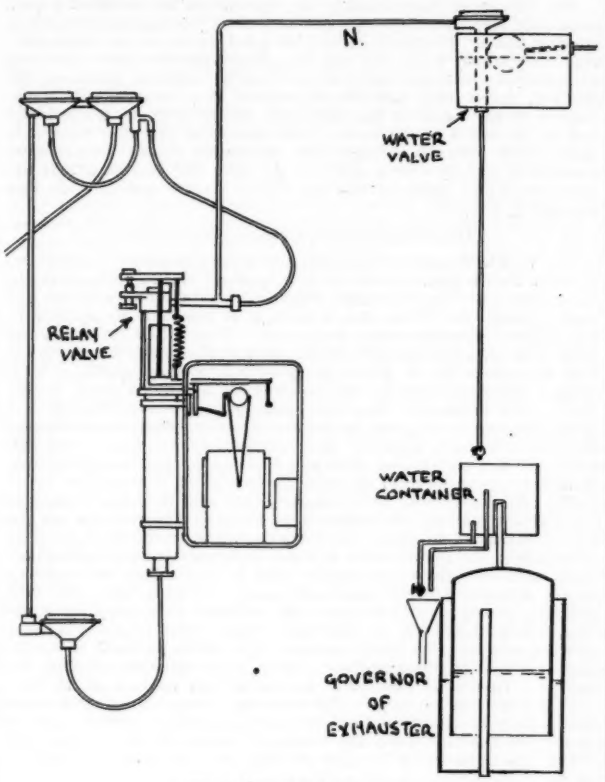


Fig. 4.—Control by Vacuum.

maximum and minimum vacuum, the hunting is diminished. The height of the overflow pipe of the water container above the other pipe determines the vacuum difference, and therefore the amount of hunting.

The effect of the vacuum range on hunting is shown on the records taken by the recording calorimeter. In fig. 5 the vacuum range was from 2½ tenths to 8 tenths, and shows very considerable hunting. In fig. 6 the vacuum range was diminished to 2 tenths, ranging between 4 tenths and 6 tenths, with diminution of the hunting. As this curve is considered to satisfy the requirements stated in the introductory paragraph, it is worth further examination. It shows no large increase of

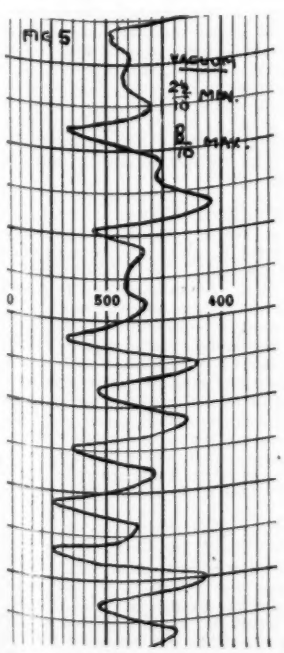


Fig. 5.

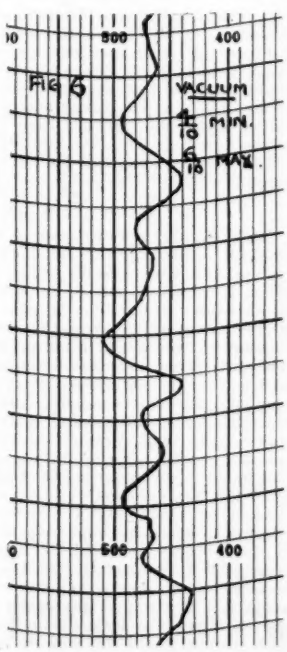


Fig. 6.

calorific value after charging retorts, which indicates that there is sufficient vacuum in the retorts at that time to draw in inerts to reduce the C.V., and incidentally to diminish leakage. At the end of the carbonization period there is no great fall of C.V., which indicates that the volume of inerts drawn in is small. It should be remembered, however, that when the vacuum is increased after charging, those retorts in which carbonization has advanced further are also subjected to the higher vacuum, but this is of small importance when balanced against the advantage of the higher vacuum in the newly charged retorts. The gas of fig. 6 is one very suitable for mixing in the holder, as it shows no large fluctuations of calorific value, and the fluctuations have a short period. The gas of fig. 5 is equally suitable for good mixing, but it does not indicate equally good carbonizing conditions. Comparing fig. 6 with fig. 7, which is the C.V. curve with constant vacuum at the exhauster, it is obvious how much more quickly satisfactory mixing can be accomplished with gas from the automatic controller. Another interesting curve for comparison with that from the automatic controller is that of fig. 8, which shows typical fluctuations of C.V. with hand control. The control is inferior to that of the automatic controller, from both the carbonizing and the mixing points of view.

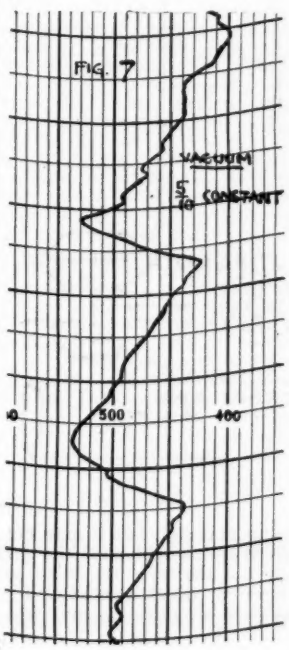


Fig. 7.

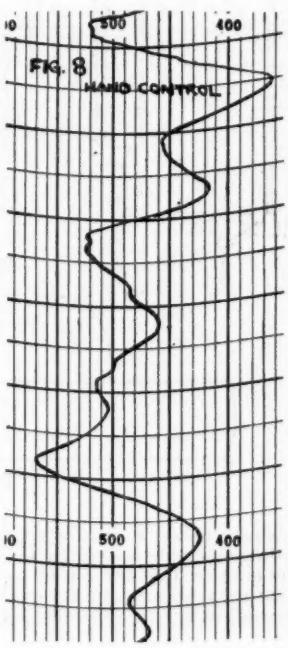


Fig. 8.

Apparatus for Mixing Retort and Diluting Gases.

The apparatus used for automatically mixing "retort" gas with diluting gas is shown in fig. 9. The diluting gas was air. The relay valve described above was attached to a recording calorimeter as at Weston-super-Mare, but it was modified to cause a rise of gas pressure with rise of C.V., instead of a fall. The variable gas pressure supplied by the relay valve was applied to load the diaphragm of the pressure governor X through which the diluting air passed. Increased gas pressure loading of the governor therefore increased the flow of air. A hand-operated valve was placed in the diluting gas on the outlet side of the governor. The results obtained are shown in fig. 10. The curve on the left shows the C.V. of the "retort" gas, which was a gas artificially varied to test the response of the automatic controller. The curve on the right is the record of C.V. of the diluted gas. The changes of C.V. of the "retort" gas were sudden at each change. It will be observed that each sudden change caused a small amount of hunting of the controller, which diminished with time. It will be noticed that the step of 10 B.Th.U. from A to B did not disturb the C.V. of the mixed gas, that the step of 40 B.Th.U. from B to C caused a variation of 10 B.Th.U., and that the last step from C to D of 70 B.Th.U. produced a change of 20 B.Th.U. It is probably inadvisable to attempt a closer control than these figures indicate, as hunting would be increased. The curves show that mixing can be achieved, and that the fluctuations of C.V. of the mixed gas are small and of an order which the mixing in the holder would easily smooth out.

In gas-works practice, if hunting should occur with the apparatus of fig. 9, it would be necessary to load the governor through a water valve as in fig. 4. The water can be adjusted to load the governor more slowly, and thus allow the recorder time to follow the change.

In all cases of automatic control it is necessary to get the

gas to the calorimeter quickly, which in practice means that the gas must be taken from the outlet of the exhauster. The gas at this point contains so much tar and impurities that it should be filtered well to avoid the necessity of frequent cleaning of the valves and orifices of the calorimeter. Iron oxide

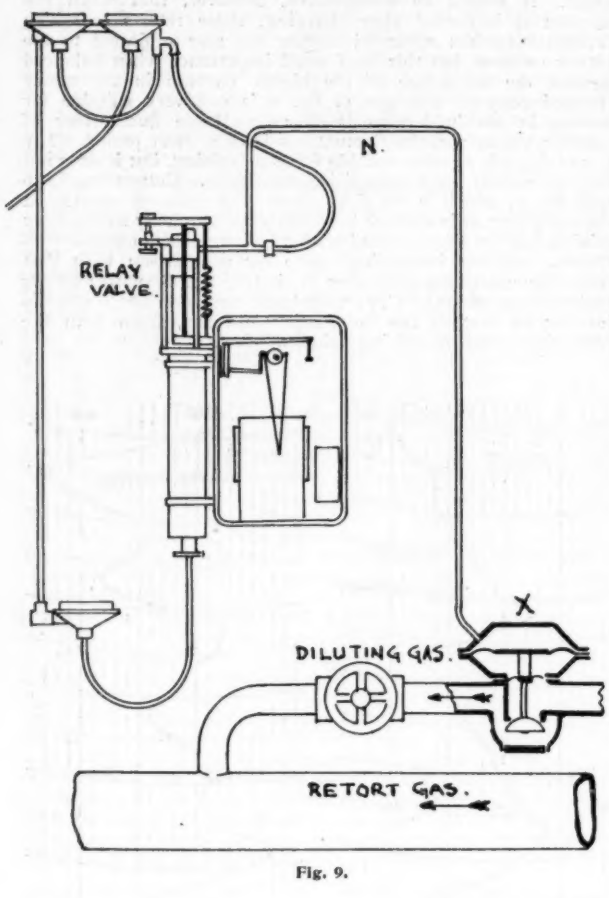


Fig. 9.

usually makes a satisfactory filtering material, but it may not always be able to stop tar fog. At Weston-super-Mare the gas is bubbled through gas oil to take out the tar. By doing so the calorific value of the gas is lowered, which is allowed for in adjusting the controller. One engineer uses for the same purpose glass balls covered with a sticky oil and placed in the bottom of his filter.

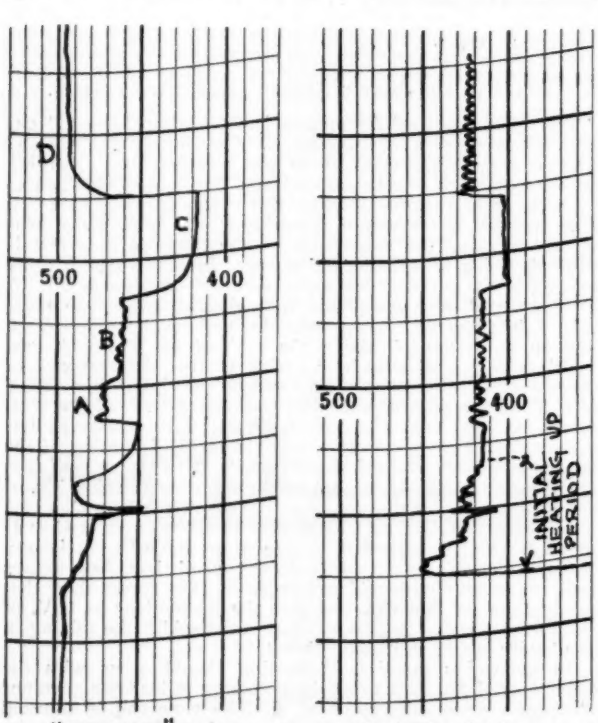


Fig. 10.

In conclusion, gentlemen, let me thank you for the opportunity given to me of describing these recent developments.

Discussion.

The President congratulated Dr. Stewart on his excellent paper, which had emphasized the fact that they must pay special attention to calorific value. If they were to give good service to the consumer, they must supply a gas not only of constant calorific value, but also of unvarying chemical composition and at uniform pressure. At Bedford, where they had vertical retorts, they had calorific value control at the outlet of the exhauster, at the inlet to the holders, and at the outlet to the town. And because of this they were able to maintain almost a straight line of calorific value; the variation amounting to only 1 or 2 B.Th.U. per c.ft. He was sure that the members would desire to ask the author several questions on this interesting subject.

Disadvantages of Drawing-In Inerts.

Mr. W. H. Warren (Gas Light and Coke Company) thanked Dr. Stewart for his paper, which he (the speaker) had found exceedingly interesting. It was, of course, essential that the quality of the gas sent out from the works should be kept as constant and as near to the declared calorific value as possible. The author had described a method of achieving this object, in which considerable ingenuity had been exercised to dilute the gas to a uniform quality. Now, as gas was chargeable to the consumer on a thermal basis, it was clearly bad practice to distribute inert gas. Furthermore, the act of introducing inert gases in the retort house—whether involuntary or deliberate—was definitely and cumulatively harmful to the efficiency of the carbonizing process. The author had suggested that it might not be harmful to draw furnace gases through the retort walls. As a matter of fact, however, the effect of doing so was to increase the porosity and leakiness of the retort by burning out the carbon deposited in pores and cracks. Variation in the quality of output from the retort house was not an essential feature of carbonizing, and was always caused by some irregularity in the working of the process. Uneven heats and uneven charging were the most common causes; and all causes of variation in quality were uneconomical, and should be removed. Apart from variation in inert content, however, the actual quality of gas made appeared to depend upon the rate of carbonization or temperature gradient through the charge. This factor seemed to be critical; an increase on the correct rate (determined empirically) resulting in degradation, and consequent drop in quality without increase in volume. Working with good-class Durham coals, the technically economic quality appeared to be about 580 B.Th.U. with purified gas containing 10 p.ct. of inerts.

Effect of Variations in Specific Gravity.

Mr. H. C. Smith (Tottenham and District Light, Heat, and Power Company) suggested that, from the point of view of the gas consumer, the paper was somewhat incomplete; and he was sure they would all like Dr. Stewart to amplify the paper later. Touching upon the problem from the aspect of keeping the gas delivered to consumers at the declared calorific value, this was naturally a thing they all desired to do. Certain limits were prescribed by the Gas Referees, and they had to work to these limits. Their aim, however, should be to work more closely to the calorific value than was prescribed. This point had been emphasized in the paper, but there was also the question of the carbonizing efficiency in the retort house itself; and in regard to this, the paper was incomplete. He would like to know the effect on the cost of carbonizing of maintaining the calorific value of the gas within the narrow limits possible by the apparatus described. Another point—and an important one—was the effect on the specific gravity of the gas when the calorific value was being levelled-up. Though, of course, they were under no obligation to supply to the consumer gas of constant specific gravity, several had found that constant specific gravity was of even more importance than constant calorific value. He felt sure that the consumer who had had his appliances adjusted to consume efficiently gas of a certain specific gravity and calorific value would notice a change in the former more readily than he would be aware of an alteration in the latter; and he (Mr. Smith) would be glad if the author could tell them of an apparatus for levelling-up the specific gravity and the calorific value of the gas at the same time.

Mixing Coal Gas and Water Gas.

Mr. Frank Prentice (Ipswich Gas Company) remarked that they were all very obliged to Dr. Stewart for his paper, for anyone who had to deal with calorific value of gas, and had to have the gas tested daily by an outside authority, was naturally pleased to listen to an expert who might be able to assist him in the work. Mr. Prentice went on to say that he was most interested in the "Sigma" instrument, for he had been almost the first to instal one, and only the week previous had ordered the latest. Nowadays they had departed from the old system of 4-hourly charging of the retorts, and had adopted longer periods; and this naturally tended to increase the difficulty of maintaining constant calorific value of the gas. Of course, with vertical retorts, there was not the same variation in the calorific value, owing to the continuous withdrawal of the gas. He had found it advantageous to remove the retort house governor from the immediate production area, and place it at the far end of the condensing plant. As a matter of fact, by doing this they had effected an enormous improvement in the regulation of calorific value of the gas produced; and this applied to both horizontal and vertical systems of carbonization. At Ipswich the calorific value of the carburetted water gas was between 440 and 450 B.Th.U. per c.ft., while that of the coal gas varied from 450 to 460 B.Th.U. Consequently there was little fluctuation when the water gas was mixed with the coal gas. Dr. Stewart had referred to the automatic control of the mixing of water gas with coal gas. Would the relay valve

be able to control the quantity of water gas passing in an 8-in. pipe to the exhauster?

EFFECT OF AUTOMATIC CONTROL DURING THE LATER STAGES OF CARBONIZATION.

Mr. W. W. TOWNSEND (Colchester Gas Company) observed that Dr. Stewart had divided his subject into two sections. First of all there was the control of the actual gas production, and then there was the control of the mixing of gases; and it was necessary to distinguish between the two operations. To him (the speaker), automatic mixture control was most desirable and scientific, and it was a thing they might be able to accomplish satisfactorily; but he agreed with a previous speaker that the method of controlling the carbonization process by a variable vacuum was fundamentally wrong. The instrument described by the author was certainly an ingenious device for keeping the calorific value of the gas made constant on the chart of the recorder; but, with every system of carbonization, there was an optimum gaseous thermal yield per ton of coal treated, and no measure of automatic control could increase this optimum. In achieving automatic control, resort was had to overpulling during the early stages of carbonization, and under-pulling towards the end of the carbonizing period. In the later stages, however, though it was true that the gas contained a high percentage of hydrogen, it could still be regarded as a "fair, straight coal gas"; and consequently the automatic device, by decreasing the vacuum on the retorts at this time, tended to lessen the yield of this perfectly good, albeit low-grade, coal gas. Concluding his remarks, Mr. Townsend said he would be glad if the author could give them information regarding the yield of gaseous therms per ton of coal carbonized under the conditions of unvarying vacuum, hand control, and automatic control.

THE AUTHOR'S REPLY.

Dr. STEWART, replying to the points raised during the discussion, referred first of all to Mr. Warren's observation that the gas consumer did not want inerts in the gas supplied to him. He (the speaker) said that, during his wanderings in the country, he had heard a man on the outskirts of a Lancashire borough complain of "bad gas," and compare it with the "good gas" in the borough itself. Actually, the calorific value of the gas supplied in the outskirts of the borough was some 30 or 40 B.Th.U. per c.ft. above that of the gas supplied within the borough itself. The trouble, however, was that in the former case there was considerable fluctuation in the heat value of the gas distributed. And, said Dr. Stewart, his experience indicated that the consumer was not at all concerned about the inert content of the gas, but objected to variable calorific value. With regard to the effect of specific gravity, this was extremely small in comparison with the fluctuations in pressure. Of course, change of specific gravity implied alteration in the chemical composition of the gas; and in cases where the size of flame was important—*e.g.*, in the incandescent mantle—the variation in composition had a marked influence. Specific gravity *per se*, though, was not so important. Mr. Warren had mentioned that the indrawing of inert gases increased the porosity of the retorts. With this statement he (the speaker) agreed; but he had not put forward the view that the system described in his paper was necessarily the best method of controlling calorific value. It was one, however—and perhaps the only one—applicable to small works; and there was a great deal to be said for it. Mr. Croft, Engineer to the Wandsworth, Wimbledon, and Epsom District Gas Company, who had horizontal retorts, had automatic calorific value control on each supply pipe from the retort houses, and he maintained that the system had resulted in a greater thermal yield of gas per ton of coal carbonized. As pointed out in the paper, there was a reaction between the coke in the retort and the indrawn furnace gases; the retort, in fact, acted as a sort of power gas producer, and it was possible to obtain a thermal yield from the coke in this manner. In regard to thermal yields, many factors had to be taken into account, and it would be gratifying if they could be separately assessed. To do so, however, would be a most difficult matter. As a matter of fact, Mr. Croft had read a paper on the subject recently; and though the questions had been discussed, little light appeared to have been shed on the subject. Mr. Smith had queried whether automatic control would affect the cost of carbonizing. He (Dr. Stewart) thought there was really nothing to worry about in this regard. At Weston-super-Mare, for example, the same number of men were employed as hitherto, and they were actually delighted to have the instruments as an aid to their working, for they realized that the apparatus not only accomplished what they formerly had to do by hand, but performed the work more efficiently. Generally speaking, it was interesting to observe the attitude of a works foreman in connection with the "Sigma" controller. At first he did not like it; but after a short time, he would not be without it.

Mr. Prentice had asked if the "Sigma" device would control the mixing of the gas when the water gas was supplied to the exhauster through an 8-in. main. Well, the relay valve gave a gas pressure which could exact any pressure on the bell. The size of pipe did not make any difference; it was merely a question of so many inches of water. Of course, the method of governing on a water gas main was by no means a new one. In a works in Birmingham, where horizontals were operated in conjunction with water gas plant, weight loading by hand was employed. It was only a short step between hand loading and loading by gas pressure; and if the pressure method was a good one, then the application of gas to vary the pressure was sound. Mr. Townsend had spoken about the optimum yield of gaseous therms from a ton of coal; but to him (the speaker) this seemed to be a somewhat doubtful quantity. After all, unless there was considerable vacuum on the retorts during the early stages of carbonization, much leakage of gas could take place through the retort walls; and, taking into account the producer action of indrawn gases, the actual thermal yield was difficult to arrive at. He did not know whether the particular method of control described in the paper did choke back the gas produced during the later stages of the carbonizing period; but it could be easily solved by putting sensitive gauges on the retorts.

TECHNICAL CONTROL IN THE RETORT HOUSE.

By RONALD B. GLOVER, Assoc.M.Inst.C.E.

[Paper before the Eastern Counties Gas Managers' Association on Oct. 18.]

This contribution deals with a subject which has received considerable attention of late under various headings; yet, as it is no doubt still accepted that profits are made or lost in the retort house, and being the subject in which I have been most interested since the commencement of my apprenticeship at the Liverpool Gas Company, I venture to offer some remarks upon it for your consideration and discussion to-day. Bearing in mind that the Eastern Counties Association serves an area where a very large percentage of its members are responsible for small undertakings, I have examined the returns of all the undertakings included in those Counties which are covered by our Association—Essex, Suffolk, Norfolk, Hertfordshire, Bedfordshire, Huntingdonshire, Cambridgeshire, Rutland, and Lincolnshire—and classified them as follows:

	Undertakings.
Under 25 million c.ft. annual output	95
25 millions and under 50 million c.ft. annual output	19
50 " " 150 " " " "	33
150 " and over	18

It may be taken that, while there is no technical objection to the installation of modern carbonizing plant with some machinery in works of as small an annual capacity as 15 millions, the practicable limit, by reason of financial consideration, will be found to be not much lower than 25 million c.ft. per annum. My remarks are intended in the main to refer to undertakings with annual outputs lying between 25 and 150 million c.ft., but no doubt engineers who are responsible for larger undertakings will be interested in these problems, and the suggestions put forward; and the discussion which it is hoped to raise may assist one or more of our members in the technical control of the retort house, and thus assist in the reduction of the cost of production.

LARGE AND SMALL WORKS.

It is fully realized that the manager of a small undertaking has many duties to perform. In many instances he has a total staff of only four or five men to carry out the whole of the duties of manufacture, distribution, and collection; and, therefore, he has little time to consider the details of efficiency in his carbonizing plant. On the other hand, he has to pay dividends, or interest and sinking fund charges, on a capital which is generally higher, in proportion to his annual thermal output, than that which has to be provided by the engineer of an undertaking which is ten or twenty times larger. Cost of production per therm may therefore play a more important part in the financial returns of a small undertaking than in a large one.

The larger undertakings have found distinct financial benefit in employing expert carbonizers to maintain the conditions in the retort house at their highest efficiency—the largest undertakings employing shift carbonizing engineers—whereas the medium sized plants are controlled by one man, or even by an assistant, who may have other duties to carry out. The whole question is governed by financial results, or, in other words, by the net cost per therm at which gas is produced.

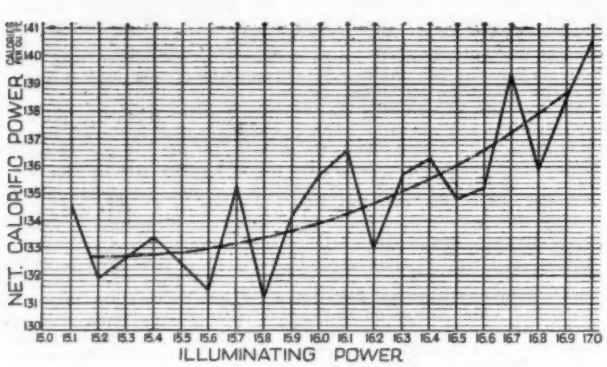
COMPETITION.

There are two other points which may be considered at this juncture. First, many of the smaller undertakings have had little competition in the past, and 6d. per 1000 c.ft., or, on the general basis of 520 B.Th.U. gas, slightly under 1d. per therm, would have little effect, in such instances, on the total annual sales. But 6d. per 1000 c.ft. on a 30 million works represents £700 per annum. In the immediate future these undertakings are certainly going to feel the effect of electrical competition; and it will be necessary to use every available means to reduce the price of gas. Secondly, the prices realized by residuals are lower than they were even twelve months ago; and this reduction must be made good in the retort house, if the price of gas is not to be adversely affected.

There are undertakings which have little suitable apparatus to assist the manager in ascertaining the results which he is obtaining in his retort house. Many managers have had difficulty in getting their board or committee to consider an expen-

diture of (say) £250 to supply essential testing apparatus; yet it can readily be shown that such an outlay can pay for itself in a very short time.

Take the example of a 20 million undertaking which is still attempting to gauge calorific values by means of a jet photometer. That a photometer is useless for this purpose has long been recognized. In the graph, the figures have been plotted from Table V. in J. H. Coste's standard work "The Calorific Power of Gas," in which he compares the results of 100 daily tests on candle-powers ranging from 15 to 17 candles against the calorific value of the gas. To save complication, the average calorific value has been taken, and Coste's own figures, which were expressed in calories per c.ft.—which, you will remember, were the units first used for this purpose in this country—have been retained. But the figures do not affect the argument, which is that there is no accurate correspondence at all between the candle-power of a gas, as measured on the photometer, and its calorific value. No doubt it can be said roughly, as shown by the "mean" curve on the diagram, that the lower candle-power gas will have a lower calorific value; but it is certain that there are undertakings sending out gas of a value 20 B.Th.U. above that prescribed by their obligations



under the Act, simply because they have no sufficiently accurate means of knowing the calorific value of the gas made.

Loss Through Excess C.V.

That this represents a clear loss under the therm system of charging is easy to show. The 20 million works with a declared value of 500 B.Th.U. is receiving payment for 20,000,000 × 500/100,000 = 100,000 therms. But if an average of 520 B.Th.U. is to be maintained for safety's sake, the actual number of therms supplied to the consumers is 20,000,000 × 520/100,000 = 104,000. That is to say, 4000 therms are made for which no payment is received. With accurate measuring and, if possible, recording instruments, it should be practicable to reduce the margin of safety to 5 B.Th.U.—that is to say, a calorific value of no more than 505 B.Th.U. may be maintained, reducing the loss to 1000 therms. These figures mean that the annual loss due to insufficient measuring apparatus is 3000 therms, which are worth, at 1s. per therm, or 5s. per 1000 c.ft. at 500 B.Th.U., £150. It is suggested that capital expenditure on instruments properly used to check excess production would actually be returned in about two years. But there are still more valuable advantages to be obtained, mainly through supplying gas of constant quality and pressure, thereby giving satisfaction to the consumer, and hence tending to increase his consumption.

Let us consider the general method of operation in a small gas-works. The exhauster is the chief controlling unit, and this, together with some form of by-pass governor and a water U-gauge on its inlet, completes the controlling apparatus. The quality of the gas produced is gauged from the observations of a jet photometer.

A consumer, when he lights a gas fire which has been properly adjusted to a given quality and pressure, realizes that the service rendered to him through the gas by the gas undertaking is good, and although he may be paying rather a high price for his heat, yet the ease with which such heat can be supplied, and the knowledge that it is always constant, gives him satisfaction. On the other hand, if the gas varies either in pressure or quality, consistency of heating value at the burner is impossible, and instead of a satisfied consumer, you have one who is ready, at the first opportunity, to instal some other form of heating apparatus.

Service First.

We represent a section of one of the largest public utility services in the country, but we have to meet a strong and growing competition. Competition is good for us all; without it we are inclined to be satisfied with ourselves, and with the results obtained by the plants for which we are responsible, instead of endeavouring by every means to improve our methods and reduce our costs. It has been established beyond doubt that increased demand, leading to reduction in selling price, can only be securely achieved by giving service to the consumer. To do this, two conditions must be kept constant—pressure at the consumers' premises, and calorific value and composition of the gas as it leaves the works.

The question of pressure at consumers' premises is outside the scope of this paper. But we all know how annoying it is to the consumer, when he has settled down for an hour, to find shortly after eleven o'clock that something has affected the heating effect of his gas fire, or that the light which he has recently adjusted, and was particularly proud of, has suddenly failed to give him sufficient illumination to read with comfort, owing to pressure having been reduced at the works. Surely, this means of reducing unaccounted-for gas is completely out of date, and should be scrapped forthwith. So much for pressure.

My main endeavour in this paper is to show that it is essential to know what is being done in the retort house. It is realized that small undertakings which are not equipped with continuous carbonizing plant whereby they can readily adjust their quality to the most satisfactory figure by the practice of steaming employ other means to bring their quality to a figure in the vicinity of 520 B.Th.U. This reduction is usually obtained by "stretching" the gas, which consists of increasing the pull on the exhauster and thereby drawing into the retorts quantities of furnace gases and, through any leaky joints of retort mouthpieces, a quantity of air—which amounts vary as the pull exerted by the exhauster increases or decreases. Not only does the proportion of the two impurities vary, but, unless the exhauster is carefully governed, their total alters, and the proportion of inerts in the coal gas is constantly varying, resulting in variation not only in composition and calorific value, but in the specific gravity of the gas—a factor which is in itself of considerable importance.

Effect of Specific Gravity

It can be shown that, if a straight coal gas of 550 B.Th.U. gross value is diluted with inerts to bring it down to 500 B.Th.U., the specific gravity of the mixture has been so changed that a given orifice capable of passing 5 c.ft. per hour at 550 B.Th.U., or 0·03 therm per hour, will be capable of passing 4·7 c.ft. per hour; and as the B.Th.U. value has been decreased to 500, this orifice will only be able to pass 0·0235 therm per hour—equivalent to a reduction of 22 p.ct.

A modern bunsen burner, such as is fitted to incandescent gas burners, cookers, and fires of good make, is capable of considerable adjustment, but that adjustment will only retain its efficiency if the quality and specific gravity of the gas are maintained within a reasonable percentage of those to which the burners are set.

Recording Calorimeters.

What, then, is the apparatus which should be used even in the smaller works, where the carbonizing plant consists of a few small settings of stop-end horizontal retorts? We have shown that, even in a works of these dimensions, £150 per annum can be saved merely by an accurate knowledge of the calorific value of the gas made. Such a saving warrants an expenditure of something less than this sum on a modern recording calorimeter. These instruments are conveniently made up in a combination giving a record, together with facilities for spot tests. The latter are necessary for calibration purposes with every form of recording calorimeter. Such an instrument shows the calorific value of the gas made throughout the 24 hours, and gives an invaluable indication of irregularities in the whole process of manufacture. With very little experience the manager is able to spot on the chart the exact times of charging and other incidents in the routine. Any departures from this are clearly shown on the chart, and any accidental occurrence which has an effect on the calorific value will be brought to his notice, together with a record of the time at which it occurred. Something a little cheaper than this instrument is an ordinary standard calorimeter, used in conjunction with one of the simpler and cheaper types of recording calorimeters.

However, such instruments only take care of the calorific value of the gas. We have shown that the specific gravity must also be kept constant; and this can only be done in practice by keeping the composition of the gas constant. This result is best attained by maintaining a constant pull on the retorts, which can be secured by means of a retort house governor and a simple form of tar column placed at the end of the retort bench. The latter enables the dip pipes to be unsealed after charging, and the maintenance of a slight but constant pull on all retorts. This simple but effective apparatus, controlled by two sensitive recording vacuum gauges, situated one on the inlet of the retort house governor and one on the inlet of the exhauster, will enable the manager to control the conditions within the retort house, and, with the aid of the recording calorimeter, he will be able to feed to his holder, and thence to his consumers, gas of constant quality, both in calorific value and in specific gravity.

Measuring the Makes from Each Plant.

There is, however, another field of control which is far too much neglected even within gas-works of considerable dimensions. True, the gas made in the whole works is measured and

recorded with great accuracy. But only in a few very large gas-works is any attempt made to measure the gas produced by the several units, except that water gas is usually separately measured.

Our friends the electrical engineers have brought down their costs of manufacture to figures at which they are a constantly growing menace to our own markets, by means of methods of measurement and control which we should do well to study and to copy as far as they are applicable to our processes. Even in a small electricity generating station it is usual to find that the water evaporated in every boiler and the fuel fed to it are accurately measured and recorded by automatic instruments. It would appear to be equally necessary for the gas engineer to know what each retort house is doing, how much gas is made in the retort house, how much coal is supplied to it per 24 hours, and how much coke is left after feeding the producers.

It is common to find in a large recently-built gas-works only one or two weighing machines in constant use—and those the weigh-bridges over which pass the carts or wagons bringing coal to the store or coke out of the yard or hoppers. Such measurements do not even indicate the results obtained over a year, since they have to be corrected for stocks which are extremely difficult of exact computation.

Automatic Weighing Machines.

It is suggested with some confidence that in a small works an automatic weigher, at a cost of something like £200, should be fixed at the entrance of the retort house, where vehicles bearing coal to the retorts or coke to the yard can be weighed and their weight recorded. In the larger works, where machinery is in use, the expenditure of £500, which appears to be the cost of a suitable weigher, is thoroughly justified.

These measurements can be checked and amplified by observations properly recorded as to the number of retorts, or number of skips full of coke which are fed to the producers, so that an accurate idea may be obtained of the quantity of fuel consumed in the carbonization process. Breeze is cheap, but there are few gas-works boilers which do not burn a proportion of coke; and coke is far too valuable a product to be treated in any other than the most careful manner. Each boiler should also be provided with one of the cheaper forms, at least, of water meter.

If the water evaporated and the breeze and coke supplied to each boiler are weighed and recorded, and if the coke fed to the producers is either weighed or carefully approximated, by recording the number of retorts discharged into the producers per day, checked by the weight of the residual coke taken from the retort house, a valuable schedule can be produced, with a small expenditure of the manager's time, which will enable him to locate any wastage, whether in the producers or in the works boilers.

There has been some confusion in the use of the term "scientific control." Really, there is nothing very mysterious about it. Science is just knowledge—accurate and systematic knowledge—and without sufficiently accurate and systematic knowledge of what is going on in any manufacturing process, there can be no scientific control of it. And without scientific control and scientific management, we shall not be able to hold our own against the keen and severe competition which is coming to us from our electrical friends.

Discussion.

The President thanked Mr. Glover for his interesting contribution, which, he said, indicated the modern trend of gas-works practice—the control of calorific value and chemical composition of the gas, in order that the consumer might obtain really efficient service from its use.

Mr. C. E. Wright (Ipswich Gas Company) suggested that the small works were handicapped by the fact that they could not afford to employ men sufficiently expert technically to test the gas. At the same time, it was highly desirable that they should have some means of ascertaining the value of the gas they were supplying. To amplify this statement, he would mention that when tests were carried out at a certain works who were under the impression that they were distributing a 480 B.Th.U. gas, it was discovered that the actual calorific value of the gas was nearly 600 B.Th.U. In another instance, calorimetric tests at an undertaking supposed to be sending out 450 B.Th.U. gas revealed the fact that the gas was 100 B.Th.U. in excess of this figure. All this demonstrated the need for co-operation between the larger undertakings and the small concerns.

C.V. Tests Easily and Rapidly Made.

Dr. J. G. Stewart (London) remarked that a boy could carry out an ordinary calorific value test with a water flow calorimeter. It must, of course, be a water flow instrument. No recording calorimeter—with the exception, perhaps, of that of Prof. Boys—could be regarded as a standard instrument during the actual process of recording. The electricity industry was in a very favourable position in this respect, because electric current was easily measured—a fact which had been largely responsible for the rapid development of this industry. In any gas-works, continued Dr. Stewart, measurement would always lead to improved results. Small undertakings commonly took a long time thinking about the installation of measuring instruments; but once they were installed, advantages accrued immediately. In many small works the fluctuation in calorific value of the gas made was enormous—sometimes the B.Th.U. content varied from 350 to 700. The workman, though doubtless not realizing this formerly, had it brought to his notice in an unmistakable way when a recording calorimeter was installed; and he quickly set about to remedy the state of affairs. With regard to accurate vacuum control, there were many **U**-tubes which were exceedingly difficult to read. It was particularly hard to read the levels—even when one had a trained eye—when the tubes were far apart. To turn for a moment to the question of specific gravity, though this might differ in different areas, the actual variation in any one area was very small in comparison with the variations in pressure. At the same time, of course, there was a good deal to be said for the measurement of specific gravity and its maintenance at a constant value.

Mr. W. Surman (Braintree), though agreeing that it was desirable and necessary to have accurate control, said that the question of cost had to be considered. It seemed that, for really effective results, there should be control not only of the calorific value, but also of the specific gravity and the chemical composition of the gas made. In the larger works—say, above 50 million c.ft. annual output—the installation of instruments for such a purpose might be justified. Then, of course, the question arose of having a properly trained man to manipulate the apparatus, for such instruments were not of great utility in the hands of the ordinary workman or foreman. Perhaps the best plan would be to employ for the work an assistant who would also be able to help the manager with the clerical tasks.

Let the Larger Works Help the Smaller Ones.

Mr. J. W. Auchterlonie (Cambridge University and Town Gas Light Company), having complimented Mr. Glover on his comprehensive paper, said that every undertaking, however small, must know what they were doing in regard to calorific value, and so on. As to the weighing of coal, he thought that an automatic recording machine was not always necessary in a small works. There was one point he would like to emphasize—that the larger concerns should do all possible to help the smaller ones.

Mr. P. J. Channon (Newport Pagnell) suggested that a lower pressure during the night tended to reduce the unaccounted-for gas. What would they do to reduce the quantity of unaccounted-for gas if the full pressure was maintained on to the district throughout the twenty-four hours?

More about Specific Gravity.

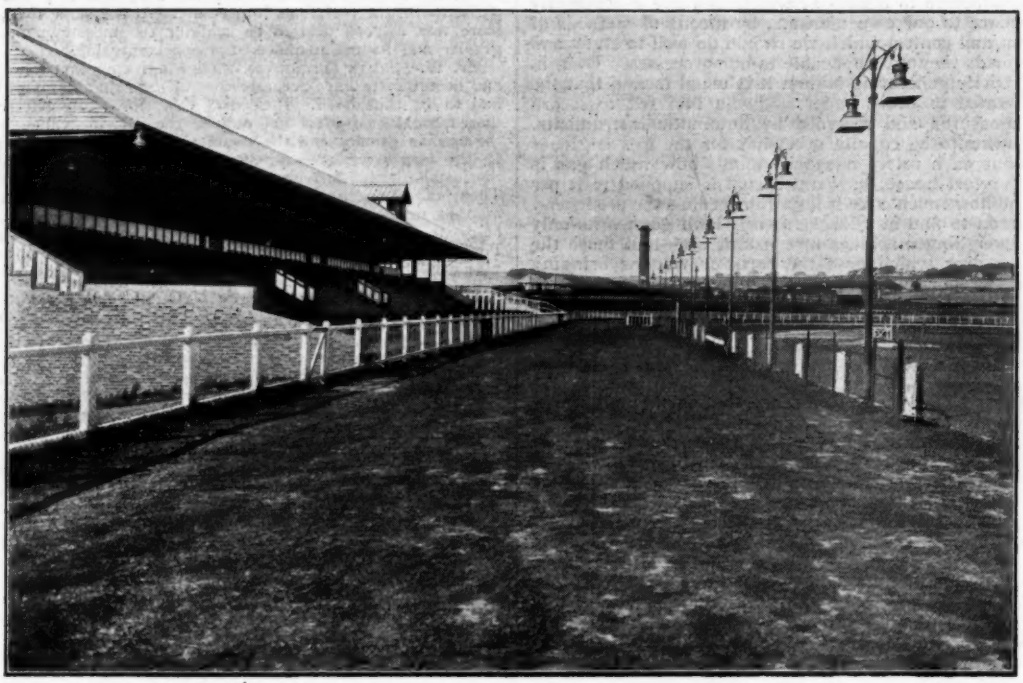
Mr. P. D. Walmsley (Great Yarmouth) said that he disagreed with Dr. Stewart's opinion that alterations in specific gravity would have little effect on the working of consumers' appliances. When the works were being reconstructed at Yarmouth, they had to employ for the time being plant which should have been scrapped twenty years previously. They were making blue water gas and mixing it with the coal gas, and consequently there were considerable changes in the specific gravity of the gas sent out on to the district. If Dr. Stewart had been at the distribution offices during that period he would have found each day fifty or sixty people complaining of "bad gas"—complaints which could be traced directly to the changes in specific gravity. Indeed, on some occasions as many as 150 or 200 people had come to complain in a single day. When the new plant was brought into operation, however, and the specific gravity of the gas supplied became constant, the complaints disappeared entirely.

Mr. W. B. Farquhar (Ilford) commented on the pressure of the gas sent out from the works on to the district. The author had asked why the pressure should be taken off during the night. He (the speaker) remembered the time when the pressure at the works was altered for the morning load, during the dinner hour, in the evening, and finally during the night; and the chart showed a series of ups and downs. When he took control of the works, however, this theory did not appeal to him. They were installing large numbers of gas fires and incandescent burners, and he found that the fitters adjusted the burners when the pressure was low, and that when the higher pressures came on the appliances did not function efficiently. He was speaking of the state of affairs twenty years ago; and conditions had been remedied by increasing the pressure early in the morning, and maintaining it at a constant value throughout the day. Of course, the question arose as to why it should be necessary to reduce the pressure at all during the twenty-four hours. Undertakings with leaky mains suggested that reduction in pressure helped them to keep down their leakage; though it had been contended that it made little difference.

The Author's Reply.

Mr. Glover, having thanked the members for the way in which they had received his paper, said how thoroughly he agreed with Mr. Wright as to the desirability of the larger undertakings coming to the assistance of the smaller ones. The former had far more opportunity of making tests on the works. They had the apparatus and the necessary technical men; and they ought to do their utmost to help their brother engineers who had charge of the smaller concerns. The latter would certainly appreciate this assistance. Dr. Stewart had spoken about the ease of carrying-out calorific value tests. It was really only a question of taking one or two tests on a standard calorimeter day by day; and it would be found that by doing so great savings could be effected. Even if no junior was employed on the works, the manager's time—it was only a matter of a few minutes—would be well spent in this manner. There was no difficulty at all about taking the tests. Mr. Auchterlonie had suggested that it might not be necessary for the small works to instal automatic weighing machines. Many of the smaller concerns, however, had no knowledge of the amounts of coal being fed into the retorts, of the quantity of coke discharged, and of the weight of coke consumed under the boilers. The only figures at their disposal were the weights of coal passing over the works weighbridge, and of coke sold to consumers; and it was a fact that a suitable weighing machine could be purchased for about £150, which, if the wagons were of equal tare, would allow of proper records of the weights. Coming to the question of pressures, Mr. Farquhar had supplied the answer. If they held the pressure for three-quarters of the day, and then reduced it for 25 p.ct. of the day, the saving in the amount of gas lost through leakage could not be very great; and it certainly seemed to him that, if leakage did exist, the best thing was to find the source of this leakage, and endeavour to remedy it.

GAS LIGHTING OF A GREYHOUND RACING TRACK.



THE NEW TRACK AT WEST BLATCHINGTON.

The considerable success attending the introduction of the new sport of greyhound racing, and its growing hold upon the affections of "the man in the street," are too well known to need any comment from a technical publication such as the "GAS JOURNAL," but that there is a field for the development of gas sales in this direction is evident from some notes supplied by the Brighton and Hove General Gas Company, who have recenly carried out the contract for lighting the new track at West Blatchington, on the borders of Hove.

We are credibly informed that already there are 52 tracks established in the United Kingdom, but the new Hove track is believed to be the first to be lighted by gas; and, as the accompanying photographs show, there is no valid reason why it should be the last.

A feature of the installation is that the placing of the lights was so designed as to illuminate two tracks—(1) the dog racing grass track, (2) the motor racing dirt track. The photographs will show that the steel standards have been placed in a verge (about 2 ft. wide) disposed between the two; the lamps being parallel with the tracks.

The dog track itself is 525 yards in length, and varies in width from 25 ft. in the "straights" to 32 ft. on the "bends;"

AN IDENTICAL VIEW, TAKEN BY THE GAS LIGHT.

VIEW OF THE COURSE FROM THE STAND.

while the inner, or dirt racing, track is approximately 465 yards long, and slightly wider on the bends.

The whole is lighted by ninety-four 1000-c.p. 10-light superheater "Rochester" lamps, each fitted with four-panel aluminium reflectors, specially designed and manufactured by Messrs. W. Sugg & Co., Ltd., of Westminster. These are suspended from 47 tubular steel columns 23 ft. 6 in. in height, the point of lighting being 18 ft. from the grass track. Over the indicator board there is fixed a 600-c.p. "Rochester" lamp fitted with parabolic reflector.

A special feature of the scheme is the control, by one by-passed valve, of all the lamps comprising the track lighting, each of which is fitted with distant control device, thus enabling the instantaneous ignition and extinguishing of the whole.

In like manner the grand stand lighting, carried out with ten 6-burner "Rochester" lamps with flat shades, is controlled by distant lighting device from the control box of the steward of the course, and is extinguished during the actual running of the races.

In addition, on the outer corners of the grand stand and looking towards the track, there are placed two 6-burner "Rochester" lamps for lighting the approach steps of the stand, and these are also controlled by the same device as the stand lamps, and are extinguished during the progress of each race.

On the rear of the stand a further three "Rochester" lamps of similar size are fitted to light the entrances to the members' enclosure and offices; but, as these are required to be alight during the whole of each meeting, they are fitted with lever cocks and by-passes.

The circulating spaces, motor parks, and paddock kennels are lighted by nine 5-light upright fixing "Littleton" lamps on tubular steel columns 15 ft. in height, and are controlled by lever cock and by-pass, as, of course, they are required to be lighted before the commencement of the meetings and extinguished only at the termination.

The private boxes in the grand stand, the turnstiles, lavatories, and buffets and the offices of the Company are also gas-lighted, all the fittings having been supplied by Messrs. Sugg.

As part of the whole scheme, the four ranges of kennels have a gas supply for food preparation for the greyhounds, and in each range of kennels the cubicle of the attendant has gas installed for lighting and cooking.

The whole of the original installation was undertaken and carried into effect by the Gas Company in six weeks; the contract being placed on June 20 and completed on July 31. The first meeting under gas-lighted conditions was held on Saturday, Aug. 4.

Since the completion of the original contract, certain additions have been made. The R.A.C. parking signboard has been lighted, and gas fires have been installed in the principal offices, while there is under contemplation the installation of gas-heated apparatus for provision of hot water for washing and bathing accommodation for thirty players, in view of the proposed use of the centre space, enclosed by the tracks, for Rugby football.

As an indication of the running cost for the track lighting at each meeting, it may be said that the consumption of gas approximates 2500 c.ft. per hour, which, at the price ruling in Brighton—viz., 9·6d. per therm (500 B.Th.U. per c.ft.)—costs 10s.; and as the duration of the meeting is two hours, the cost approximates £1 per night (track only).

Lighting Data.

Grass track	25 ft. wide
Dirt track	28 ft. ,,

Columns placed 30 ft. apart. Two lamps on each column 9 ft. between centres parallel with track.

Horizontal Illumination.

—	Grass Track.	Dirt Track.
	Foot-Candles.	Foot-Candles.
Minimum on outer edge	1·5	1·09
Maximum ,, ,, ,, ...	1·55	1·1
Minimum on centre of track	7·32	6·23
Maximum ,, ,, ,, ...	8·66	7·61
Minimum on inner edge of track . .	11·0	11·0
Maximum ,, ,, ,, ,, . . .	11·9	11·9

Outer edge means edge farthest from lamps and inner edge close to lamps.

Illumination on running hare = 10 foot-candles.

Low-Temperature Plant at Erith.

According to the current issue of "Combustion," the first unit of a 1000-ton per day plant to be erected by Continuous Coal Carbonization, Ltd., is now practically completed, and should be in production this month. The plant will be producing hard, smokeless briquettes for domestic and industrial use, motor spirit, fuel oil, lubricating oil, and gas for lighting and power. The plant is located at Erith, about fourteen miles from Central London, where the Company have secured a site of approximately five acres. It is connected by the Company's own sidings with the Southern Railway at Erith Station. The undertaking also possesses its own wharfage on the River Thames, where ocean-going vessels can discharge coal directly into the bunkers. The wharfage capacity is over 3000 tons in and out per day, thus affording a considerable saving to the Company not only in freights, but also in labour costs, through there being no double handling. In addition to the main commercial plant, experimental and testing plants are also being constructed, it being the policy of this undertaking to centre at Erith all the research work of the Company on the low-temperature carbonization of coal by the continuous system. The German and American patents of the process have now been granted to the Company, who had previously obtained the English, French, and Belgian patents.

SOME FURTHER NOTES AND COSTS OF THE INSTALLATION OF VERTICAL RETORTS AT THE DROYLSDEN WORKS.

By W. BUCKLEY, of Droylsden.

[Before the Manchester District Institution of Gas Engineers, Oct. 17.]

In May, 1923, a paper was submitted to this Institution which gave in detail the maintenance and running costs of an installation of Glover-West continuous vertical retorts at the Droylsden Works of the Manchester Corporation Gas Department.

That paper evoked quite an interesting discussion, and as it served a useful purpose, our President has suggested that the cost of maintenance of the reconstructed setting (retorts and producers only) should be placed before you in the hope that the information may be of some service to you as members and to the industry generally.

During the reconstruction in 1921, considerable alterations were made to the plant. Instead of the retorts being heated in units of four, arrangements were made whereby the retorts were heated in units of two. At the same time the major axis of the retorts was increased from 30 in. to 33 in. at the top.

problem to account for the varying behaviour of individual retorts. For example, No. 1 retort in No. 1 bed very early showed signs of weakness at a point where you would least expect it—*i.e.*, in the first combustion chamber, but where the scotches are built between the front and back retorts. When dropping this retort from the bottom, a stoker pushed the rod through at this point. A temporary repair was effected, and the retort was made good when let down in 1923. Why this difficulty should have arisen is still a problem. All the retorts were built by the same men, to the same design, and from the same delivery of material; yet this was the only retort of the eight which gave the slightest trouble during the first period of gas-making. The plant has been working for 18 years, and this is the only occasion when a weakness has occurred at this point.

After working for a period of from 810 to 1047 days, two of

TABLE I.—*Carbonizing Record of No. 1 Bed.*

Retort.	1st Period.			2nd Period.			3rd Period.			Total Days to Date.
	Retort On.	Retort Off.	Days Worked.	Retort On.	Retort Off.	Days Worked.	Retort On.	Retort Off.	Days Worked.	
1	1922. Jan. 9	1923. Mar. 25	428	1923. Oct. 29	1924. Nov. 24	382	1925. Nov. 12	1928. Aug. 10	1002	1812
2	Jan. 9	May 8	472	Oct. 29	Dec. 13	405	Nov. 14	Aug. 10	1000	1877
3	Jan. 9	May 9	473	Oct. 27	Nov. 11	371	Nov. 12	Aug. 10	1002	1846
4	Jan. 9	May 7	471	Oct. 27	Dec. 13	405	Nov. 13	Aug. 10	1001	1877
5	Jan. 10	May 10	473	Oct. 26	1925. April 29	574	Nov. 12	Aug. 10	1002	2049
6	Jan. 10	May 8	471	Oct. 26	April 28	573	Nov. 14	Aug. 10	1000	2044
7	Jan. 10	May 9	472	Oct. 26	April 29	573	Nov. 12	Aug. 10	1002	2047
8	Jan. 10	May 7	470	Oct. 26	April 28	572	Nov. 13	Aug. 10	1001	2043

TABLE II.—*Carbonizing Record of No. 2 Bed.*

Retort.	1st Period.			2nd Period.			3rd Period.			4th Period.			5th Period.			Total Carbonizing Days.
	Retort On.	Retort Off.	Days Worked.	Retort On.	Retort Off.	Days Worked.	Retort On.	Retort Off.	Days Worked.	Retort On.	Retort Off.	Days Worked.	Retort On.	Retort Off.	Days Worked.	
1	1921. Dec. 15	1922. May 31	167	1922. Oct. 26	1924. April 9	531	1924. Oct. 22	1926. May 4	559	1926. Oct. 22	1927. April 12	140	1927. ..	1928. ..	..	1397
2	Dec. 15	May 30	166	Oct. 26	April 8	530	Oct. 22	May 4	559	Oct. 22	April 11	139	Oct. 24	Mar. 1	130	1524
3	Dec. 16	May 31	165	Oct. 26	April 10	532	Oct. 22	May 4	559	Oct. 21	April 12	141	Oct. 24	Mar. 4	133	1531
4	Dec. 16	May 30	164	Oct. 26	April 6	528	Oct. 22	May 4	559	Oct. 21	April 11	140	Oct. 24	Mar. 4	133	1525
5	Dec. 14	May 9	146	Oct. 27	April 2	523	Oct. 23	Mar. 29	522	Oct. 26	April 10	125	Oct. 25	Mar. 5	133	1450
6	Dec. 14	May 9	146	Oct. 27	April 8	529	Oct. 23	Mar. 28	521	Nov. 1	April 9	122	Oct. 26	Mar. 6	133	1455
7	Dec. 14	May 8	147	Oct. 27	April 10	531	Oct. 23	Mar. 29	522	Oct. 27	April 10	124	Oct. 27	Mar. 7	133	1457
8	Dec. 14	May 8	147	Oct. 27	April 6	527	Oct. 23	Mar. 29	522	..	..	..	Oct. 28	Mar. 7	132	1328

The control of the heats in the settings is now an extremely simple matter, and the alteration has resulted in an increased yield of therms per ton of coal carbonized. The average therms produced over a period of ten years in the original setting was 68·65 therms per ton, and this has been increased to 79·6 therms per ton of coal carbonized in the reconstructed setting.

To provide for an overhead collecting main, the bottom of the coal storage bunkers had to be cut away and re-arranged. As this reduced the capacity of the bunkers, the sides were raised about 2 ft., but the storage is still only equal to about 36 hours' supply, and this entails the attendance of the coalers at the works for one hour on Sunday during the summer months, and two hours during the winter—*i.e.*, when both beds are working. It is proposed in the near future to re-arrange the delivery from the coal elevator to enable a full 48 hours' supply to be carried in the storage bunkers. In the original plant only 24 hours' supply was provided for. Gas engineers are wiser these days.

As you will observe, the main portion of this paper consists of a series of Tables. In the first and second are shown the carbonizing records of both beds. You will note there is considerable variation in the life of the retorts. It is always a

the retorts had developed holes; and as some spalling had taken place in the other retorts, it was decided to rebuild the four bottom sections of these eight retorts. This work was carried out during the summer of 1925. Gas-making recommenced in October, 1925, and continued until August, 1928, when the retorts were let down for re-building. On dismantling, the bottom sections were found to be in excellent condition. Though the sections were rough, very little spalling had taken place. The total time worked by this bed from the re-building in 1921 until it was dismantled in 1928 was 15,595 retort days. After making an allowance of 3 p.ct. off for scurfing, this gives us 15,127 actual retort carbonizing days—an average of 1891 days per retort. The maximum working days for any one retort amounted to 1988, and the minimum working days for any one retort to 1776.

When vertical retorts are nearing the end of their life, it is sometimes rather troublesome to recommence gas-making after scurfing. The carbon having been burnt off leaves the retort rough, and this interferes with the free movement of the coal and coke through the retort. As soon as a little scurf deposits on this rough surface, gas-making proceeds normally. To overcome this difficulty, it was decided to scurf without empty-

ing the retort; and the method adopted was so successful that for eight months none of the retorts was emptied for this purpose.

With a view to economizing coal at the commencement of the coal stoppage in 1926, the retorts in the front row were adjusted to convert them into mainly water gas producers—*i.e.*, the extractors were masked off to give the minimum movement of coal and coke through the retorts, the steam remaining as usual. The back retorts—*i.e.*, those farthest from the producer gas inlet—were run under normal conditions, with the result that at no time did the calorific value fall below 440 B.Th.U. per c.ft. Normal conditions were resumed when supplies of American coal were available.

Advantage was taken of this experience to scurf without emptying the retort. The necks were cleaned about every two months, or as required; the extractor being masked off to the minimum, and steam passed through for 48 hours. This method was so successful that, as mentioned before, none of the eight retorts was emptied for scurfing for eight months. It is interesting to know that experiments of an exactly similar character were carried out at the works of another of our members.

In connection with this bed there is a rather interesting exhibit on the table; and here again is one of those little problems which it would be a pleasure to solve. It is the first time that glass has been produced in the settings at Droylsden. The specimen represents a portion of the floor tile at the bottom of the first combustion chamber; and, as you can see, the silica has fluxed, uniting with certain constituents of the ash carried forward from the coke consumed in the producer, resulting in a layer of vitreous material closely resembling black glass resting on the unaffected silica floor tile.

During the life of the settings, the temperature has been the same approximately in similar chambers—*i.e.*, the three bottom chambers have been run at from 1100° C. to about 1250° C., and yet it is only in one section (or shall we say one chamber?) that the fluxing has taken place.

There is little to say regarding the behaviour of No. 2 bed. No. 8 retort did not work during the fourth period. This retort was repaired near the bottom during the summer of 1926, but the jointing material used (experimental) was not according to instructions, with the result that the patch came out almost as soon as the retort was put in action. None of us like to confess to failures, but we must pay for experience.

No. 1 retort was out of action during the fifth period. The total retort days worked by this bed were 11,663. After making an allowance of 3 p.ct. off for scurfing, this gives us 11,324 actual carbonizing days—an average of 1415 days per retort. The maximum working days for any one retort amounted to 1482, and the minimum working days for any one retort to 1288.

You will observe that this bed worked during five gas-making periods, against three periods for the No. 1 bed. No doubt the letting-down and lighting-up of the setting had some influence upon the life.

During the discussion of the previous paper, Mr. Jennings suggested a loss of 100 days each time a vertical setting was let down.

The original retorts were built of moulded sections; and when it was decided to rebuild with moulded retort brick, fears were entertained that there would be greater loss of gas through the joints, of which there are so many. It is pleasing to record that these fears were unfounded; the leakage of gas from the retorts has been practically negligible.

TABLE III.—*Summary of Working Days of the Retorts.*

Total retort days worked by the setting, less 3 p.ct. off for scurfing—			
No. 1 bed	15,127	retort days	
No. 2 bed	11,324	,,	,,
	26,451	,,	,,
Average life of all retorts	1,653	,,	,,
Maximum life of retort	1,988	,,	,,
Minimum life of retort	1,288	,,	,,

Since the retorts were reconstructed, accurate records have been kept of the wages paid and of the material used for repair. These are shown on Table IV. This table also contains the data necessary for calculating the maintenance costs.

TABLE IV.

The settings were reconstructed in 1921. Commenced gas-making on Dec. 14, and continued until Aug. 10, 1928.

Cost of Repairs to the Settings.

NO. 1 BED.

	£ s. d.	£ s. d.
Original cost of setting		1000 0 0
Wages	148 16 4	
Material	127 10 0	
	276 6 4	
	£1276 6 4	

NO. 2 BED.

	£ s. d.	£ s. d.
Original cost of setting		1000 0 0
Wages	188 18 3	
Material	130 8 2	
	319 6 5	
	£1319 6 5	
Total cost of both settings	2595 12 9	
Producer ironwork	44 18 6	
Total	£2640 11 3	
Coal carbonized during the period	54,216 tons	
Gas produced	933,073,000 c.ft. equals 17,210 c.ft. per ton	
Average calorific value	462·5 B.Th.U. per c.ft. equals 79·6 therms per ton	

Though No. 2 bed has worked for a much less number of days than No. 1, the sum expended for repairs has been greater by about £43.

Producer ironwork has cost £45, a fairly heavy item, but various types of bars have been tried for experimental purposes, and there are sufficient in stock to meet requirements for at least a further two years.

TABLE V.—*Summary of Maintenance Costs.*

Total cost of maintenance of retorts, including original cost of retorts and silica lining, also repairs to the producer and producer ironwork	£2640 11s. 3d.
Coal carbonized	54,216 tons
Maintenance cost per ton	11·687d. per ton
Therms produced per ton	79·6 therms
Maintenance cost per therm	0·1467d.
	14·67d. per 100 therms.

Though the required data have been extracted from the records, it has not been thought necessary to separate the costs of the two beds. We are concerned mainly with the average.

No attempt has been made to break records, and 79·6 therms per ton looks small when compared with some of the figures which from time to time are published in the Technical Press; but it will be found that this is a very good average at a calorific value almost always over 460 B.Th.U. and for a period of years.

TABLE VI.—*Comparison Between the Maintenance Costs of the Original Retorts and the Setting after Reconstruction.*

ORIGINAL SETTING.

Repairs and maintenance	6·5d. per ton
Therms per ton	68·75 therms
Average cost per therm	0·0946d.
	equals 9·46d. per 100 therms.

SETTING AFTER RECONSTRUCTION.

Repairs and maintenance	11·687d. per ton
Therms per ton	79·6 therms
Average cost per therm	0·1467d.
	equals 14·67d. per 100 therms.

Table VI. gives the comparison of cost between the original settings and after reconstruction. A very superficial examination of the results obtained from the two settings is sufficient to convince anyone that the only method of comparison must be on the basis of therms produced, and not tons of coal carbonized.

Maintenance of original settings	9·46d.	per 100 therms	
Reconstructed settings	14·67d.	,,	,,

The cost is, of course, higher, but it must be borne in mind that this is an entirely post-war cost; and you all realize what that means, where labour and material are concerned. The increase of 11 therms per ton has assisted materially in keeping the cost down.

TABLE VII.—*Average Maintenance Cost of the Retorts and Producers from July, 1910, to August, 1928.*

Repairs and maintenance	8·332d. per ton
Therms produced per ton	72·5 therms
Average cost per therm	0·115d.
	equals 11·5d. per 100 therms.

It has been suggested that the maintenance cost of the retorts and producers from the time the installation was put into operation until the present time would be of interest, and this is shown in Table VII.

TABLE VIII.—*Supplementary Data*

Coal carbonized during the period	54,216 tons
Average gross cost of coal	29s. 8·55d. per ton
Average net cost of coal	14s. 9·72d. per ton
Gas produced	933,073,000 c.ft. equals 282,272 c.ft. per bed per day, or 564,544 c.ft. for the setting
Maximum day's make with all on	712,000 c.ft.
Minimum day's make (one setting)	208,000 c.ft.
Average gas per retort per day	35,275 c.ft.
Average gas made per ton	17,210 c.ft.
Average calorific value	462·5 B.Th.U.
Therms per ton	79·6
Coke sold per ton	8·2 cwt.
Tar sold per ton	15·40 galls.
Ammonia liquor sold per ton	32·2 galls. of 10 oz.
Carbonizing costs	2·11d. per 1000 c.ft.
Cost of gas into holder	18·9d. per 1000 c.ft.
	equals 4·086d. per therm.

Table VIII. contains various supplementary data which will

no doubt be of interest. The cost of 4·086d. per therm is the average, and includes the high cost entailed by the coal stoppage. The lowest cost into holder was 2·96od. per therm, and the highest cost into holder was 6·047d. per therm.

It will be a pleasure to reply as far as possible to any questions which may be asked. On the table there are the scurfing sheets covering the whole period. These may be of interest to some of you, because short notes are entered each time the retorts are scurfed; you can see exactly how the plant has behaved.

Discussion.

The President (Mr. R. H. Ginman, of Leek) said he was sure he expressed the feelings of all present in congratulating Mr. Buckley upon the meticulous care with which over a long period results had been recorded and brought up to date. His own practice was to run from 85 to 88 therms with something like 7¼ cwt. of saleable coke. There had been times when he had to force his own settings. His first installation was put in in 1924, and the second in 1926.

Mr. W. J. Smith (Bolton) said that, working with the water gas reaction, they had found that after a period of about six months they had to scurf in the ordinary way. Naturally this would vary with the type of coal that was being used. They had found it useful to work with coal (say) for about four weeks, and then turn over to the water gas reaction. In that case they could keep the scurf down very reasonably, with the exception of two feet of the retort. The yield of gaseous therms per ton which Mr. Buckley got in his reconstructed setting was good if this was an average result; but he thought the yields were not constant, and that if an average was taken the figures would be a little less than had been stated. If more therms were wanted, one had to employ a higher temperature. In conclusion, he congratulated Mr. Buckley upon being one of the energetic members of the Institution, and hoped they would have more papers of this type.

Mr. H. Curtis (Macclesfield) remarked that he was not in a position to dispute any of the figures which had been given; he did not suppose any member present had had a longer experience of this type of retort than Mr. Buckley. To his mind, the vitreous material which had been mentioned was due to local combustion; and he would be much interested to hear at what part of the setting it occurred. Possibly it was in the lower section, where there was the maximum heat. With regard to the costs, the figures would naturally compare favourably with those obtained in a station where the plant had to be let down during the summer. In that respect he understood Droylsden was favourably situated.

Advantage of Continuous Running.

Mr. C. S. Shapley (Leeds) said it could be seen clearly that vertical retorts were exceedingly good when they were run continuously; it was, however, doubtful whether they were seasonable plants. This statement was borne out somewhat by the figures given by Mr. Buckley in reference to No. 2 bed, where the working days were reduced. It had been the experience at Leeds, where they were more fortunate than many of the smaller works, because they were able to run their vertical retort installation continuously. It was never stopped except for resetting or relining. Various methods of scurfing had been tried, but they went back to the old-fashioned way to get the retort completely scurfed. It was much more satisfactory. It would be interesting if Mr. Buckley would state whether the steam pressure was increased above normal when scurfing. The author evidently worked his settings at rather lower temperatures than did the average gas engineer. One could understand that Mr. Ginman, who got 85 to 88 therms, would not employ a temperature of 1100° C. In Leeds they ran from 1200° to 1280° C. with a maximum of 1350°; all the combustion chambers were examined twice every shift, and records taken. The chemist took spot tests, and they were reported to his (the speaker's) office. Mr. Buckley's figures worked out at 2·05 tons per retort per day, and he took it that the normal capacity of the retort was 2½ tons.

In a large works it was very difficult to test over a period any particular plant, especially if it happened to be a comparatively small unit; but during the summer of 1927 they did test their beds over a period of twelve weeks. Copious samples were taken of the coal used during the period of the test, and the average worked out: Ash content, 6·6 p.ct.; volatile, 31·7 p.ct.; fixed carbon, 61·7 p.ct. The retorts had been in operation for 600 days since they were last reset, so they could not be considered to be new in any way. The gas made was 3,049,000 c.ft.; average per retort, 45,000 c.ft.; per ton corrected, 16,669 c.ft.; calorific value, 473 B.Th.U. per c.ft.; therms per ton, 78·8. The figures closely approximated to those Mr. Buckley had given. The ammoniacal liquor per ton amounted to 36·75 gallons. He did not know whether the author had any coke-handling plant. A large installation would have it. At Leeds, between November, 1922, and March, 1928, the coke-handling plant handled 701,031 tons of coal and coke, and the cost of repairs was £5452—equivalent to about 1·97d. per ton. That figure might interest some who had not gone into the matter carefully. Coke-handling plant, particularly with vertical retorts, where there was so much dust, was liable to be a source of great trouble unless properly looked after; and if Mr. Buckley had not got plant of that description, he had a little more experience to come.

Effects of Steaming.

Mr. J. Mitchell (Nelson) pointed out that the paper did not refer to the effect of steaming; and he would like Mr. Buckley to say whether he had experienced trouble from that cause. Did it affect the retort walls? In their own case it was necessary to have a bricklayer continually on the settings. Like Mr. Shapley, they had the combustion chamber examined twice every shift by a man whose duty it was to look after the heats. It was surprising how temperature varied; and unless a proper temperature was maintained, one was bound to have trouble.

Mr. H. R. S. Williams (Altrincham) said that study of the paper would be very useful in the future. His experience of vertical retorts had not been sufficiently long to enable him to give any figures, but there were one or two points which he wished Mr. Buckley to elucidate further. One was with regard to scurfing by means of steam only. What period elapsed between the scurfings? Did Mr. Buckley allow the gas from that retort to mix with the gas made by the other retorts, or did he simply blow it away? It seemed to him that the admission of a large quantity would reduce the calorific value below 460 B.Th.U. He took it that Mr. Buckley was using material containing approximately 90 p.ct. of silica. It would be useful to have the experience of those who used retorts where the percentage of silica was higher—say, 96—as to what was the life of them, whether they suffered from spalling or from other troubles. Generally, which was the better material? In the case of horizontal retorts, he did not think there was very much to choose, but personally he preferred to use silica material for combustion chamber work. Siliceous material had a tendency to flux in the combustion chamber. He had been using silica now for some years.

Comparison with Horizontals.

Mr. C. R. Ingham (Brighouse) raised the question of the maintenance cost of 9·46d. per 100 therms given in Table VI. He worked this out to something like £600 a year. Within the last two years he had put in horizontal retorts; and he did not like to think he would be faced with £600 per year for maintenance charges. He supposed for horizontal retorts it would be somewhat lower. In Table VIII. the average net cost of coal was given as 14s. 9·72d. per ton. He assumed that the average was taken over a long period, which included the coal stoppage. At the present time with horizontals the net cost of coal was more like 5s. per ton. Of course, he expected that the present-day cost of coal for vertical retorts would be very much lower than the figures given in the paper; and it would be interesting to compare them in order to see which gave the lower cost—the horizontals or the verticals. Some people asserted that water gas could be made more cheaply than gas from straight carbonization in horizontal retorts; and if that was so, some combination of horizontal retorts with water gas plant might be the more economic method of manufacture.

Fluxing.

Mr. W. M. Carr (Stretford) called attention to the passage which stated that fluxing took place only in one section. Was the combustion chamber, where the fluxing took place, in the same setting where the experimental jointing material had been used? He had had two cases where fluxing took place in settings, due to some extraneous matter which got in. Even a small amount of material would set up a flux which, though small originally, would spread through the whole setting. Another interesting point was the shortened life of the setting due to frequent letting-down. Information on that point was lacking. For some years he had been trying to collect data as to the effect which starting-up and letting-down had upon the life of the setting. Undoubtedly deterioration occurred under such conditions not only in vertical retorts, but also in horizontals. It was well known that, if a horizontal setting had to be let down repeatedly, the life was very much less than it would be otherwise. Mr. Buckley had given valuable data; and similar data for horizontal retorts, he believed, would not show much difference.

Mr. H. C. Handley (Denton) said they had just set down two beds which had had continuous fire under them for a little over 7½ years. Experience showed that maintenance of a continuous fire was better than letting the fire out, even for relining, as long as one made certain that the producers were able to keep going. He would like Mr. Buckley to tell them a little more about furnace doors. He himself had been using cast-iron doors for the producers.

Mr. W. B. Smith (Bolton) explained that his practice was to scurf with the water gas reaction until such time as the necks got troublesome, and then to change to normal scurfing. He thought it was good practice in vertical retorts so long as one did not work with too high a calorific value.

Yorkshire Coal.

Mr. W. B. McLusky (Halifax) said that vertical retorts had been installed at Halifax for seven years, and for that period the cost of maintenance had been less absolutely than the pre-war cost of maintaining inclined and horizontal retorts. It would be misleading to compare the number of therms per ton. Yorkshire had the best coal in the world, and it could produce more gas than was yielded by Lancashire coal; so if Mr. Buckley wanted more therms per ton, he should buy Yorkshire coal. In some of the retorts there was no carbon for 10 ft. up and for 8 ft. down; but between those points a little deposit occurred. He considered the reason why they had escaped carbon troubles at Halifax was because the heating of the setting was more evenly distributed than was the case in other installations.

Vote of Thanks.

Mr. R. E. Gibson (Liverpool) remarked that 1923, when Mr. Buckley gave his previous paper upon this subject, was his presidential year. The paper was of great value to the Institution, and gave rise to a very good discussion. Mr. Buckley had again made them his debtors by contributing a paper which had been prepared with the greatest possible care, and was equal to the previous one. He believed Mr. Buckley had special facilities for getting at the truth in regard to these matters because he dealt with a small installation which he knew thoroughly, and could easily get out the figures for maintenance. At Liverpool the costing system in use enabled them to find out fairly accurately the cost of repairs to various parts of the plant. If the original cost was left out of account, the figures for ordinary repairs and maintenance of the vertical retorts at Linacre were very nearly the same as Mr. Buckley's. He was very pleased this paper had been put before the members, because in recent years the Institution, he thought, had been inclined to neglect the technical side of their activities. He hoped that it would be followed by

many more like it; and he had the greatest pleasure in proposing a vote of thanks to Mr. Buckley.

The vote of thanks was seconded by Mr. MITCHELL and carried by acclamation.

THE AUTHOR'S REPLY.

Mr. BUCKLEY said that during the period of the coal stoppage coal was economized by reducing the individual drive on the retorts and passing the steam through at a normal pressure, which varied from 10 to 12 lbs. The steam went through a ¼-in. pipe fully open. On some of the retorts he had controlling valves for experimental purposes. To get rid of the whole of the scurf at the top of the retort would entail a higher temperature around the top section. This he deliberately refused to countenance, because, though there would be an increased yield, trouble would occur. The proper way to run a vertical retort was to keep it under practically a level gauge at the top and at a moderately high temperature—say, from 1100° to 1250° C.—in the bottom section. The therms per ton were taken over the whole of the period from 1921 until August, 1928—not in any snatch period, but the average which was published in the statistical statement issued by the Gas Department. During the last four years they were the Gas Examiner's figures, but prior to that they were taken by himself in the laboratory.

In rebuilding straight to the bottom, the scaffold for the men to work from was a difficulty. Originally the bricklayer stood on a chair which was lowered from the top, but the bars of the chair were always in his way. To overcome this difficulty, they used an adaptation of a window cleaner's ladder. One ladder was stationary from the under-side of the top section to the floor below the scaffold. On the top of another ladder which slid inside it was a plank on which a man could stand. The plank was brought up to the level of the work, and there was nothing round the bricklayer to interfere with him, and he got on much quicker, and could make a very good job.

With regard to the vitreous material, this was due to the introduction into the combustion chamber of some extraneous matter. What he wished to know was why it occurred in one chamber only. In the whole of the combustion chambers the temperatures had been practically the same. It might be that that particular chamber had a slightly bigger flow of gas from the producer. Why, however, was it black? The appearance tended to induce the impression that there was some manganese in it, but there was practically no manganese in coal. It might be black oxide of iron. He hoped to have it analyzed, in order to see of what the glass actually consisted.

Many people appeared to think that at Droylsden they were so fortunate as to be able to light up a plant and run it as long as they liked. This was not the case. They could run two beds at the maximum until Easter. When that date was passed the demand in the district for gas was not sufficient to allow him to carry on. He could not possibly run after Whit-week. He did not trouble much about throughput. He was concerned with output; and if he could get 600,000 c.ft. from a 500,000 c.ft. plant, he would be satisfied, whether it was with 2 tons or 2½ tons. If it was with 2 tons, all the better for his costs. At Droylsden they had no machine for handling coke. Everything was, as one of the workmen had phrased it, "mandraulic." About two years ago a large coke bunker was put in for filling a motor wagon. All the coke was received at the retort house and taken into the coke elevator, the cost of which he gave in his previous paper. The figure of 0·414d. per ton of coal carbonized compared very favourably with Mr. Shapley's figure for coke-handling plant—1·97d.

Steaming was a subject in which he had been keenly interested. He had made careful observations for ten years, and sometimes he believed he had arrived at a solution of the problem. But then came a series of results which absolutely contradicted the previous ones. In his opinion there was not much doubt that the steaming had some slight effect as a cause of spalling, but he would not like to state this definitely. There were other determining factors. On one occasion he observed spalling three sections up the retort while the bottom sections were in perfect order. Now if spalling had been the cause, the greatest amount of damage would have occurred at the bottom of the retort. When the retorts referred to were rebuilt, the bottom did not spall very much. There was no actual fluxing, but there was a thickening pretty well all over the section.

Mr. Williams had asked about the period of scurfing. He commenced four weeks after the plant had been put into action; then one retort was scurfed each week. That gave an eight weeks' scurfing period. He used the ordinary method of scurfing; and when the retorts were new, one could run it six hours, scurf for 24 hours, and get the retort working again normally in another six hours, giving about 36 hours from the time gas-making was stopped to the time when it was resumed. During the later life of an old setting, all gas made in the retort under scurf was sent in with the gas made in the other retorts. There was only one retort out of the eight which was under scurf, and the steam was at a low pressure. He had never had the slightest difficulty in regard to low calorific values; at no time did they get near the danger zone. There was one occasion when the Gas Examiner found about 440 B.Th.U., but that was because a leak in one of the valves into the connecting main had not been attended to as it should have been.

Some time ago a new kind of fireclay cement was brought to his notice. In order to test it, he gave instructions for 10 p.ct. of it to be mixed with the ordinary silica used for jointing material, but through some misundertanding the mixture was made fifty-fifty. The heat caused this mixture to flux very rapidly, and as soon as the coke began to fall down the retort, the whole material fell out of the combustion chamber. However, when 10 p.ct. of the cement was mixed with ordinary silica, they got a good hard joint. To test it, one could put two firebricks together, place them in the combustion chamber, leave them there for a week, and then they could be hardly broken apart. The members knew how different this was from the ordinary silica cement. The figure given for the average net cost of coal was for the period from 1921 to 1928. Therefore it included the big prices which were paid for American coal during the stoppage.

Mr. Handley had mentioned a case where there was continuous working for 7½ years. That could not be reasonably compared with a case where the retort had to be let down and lighted up. A relatively high temperature was maintained in the setting the whole of the time, and there were not the contraction and expansion which occurred in normal working conditions. The fluxing he had referred to was in No. 5 retort, No. 1 bed. The patch which fell out was in No. 8 retort, No. 2 bed. He had adopted a new type of door at the bottom of the retort. It was circular, and rotated on its support, so that every time it was closed it got a fresh seating. This was a sufficient reason why it had a longer life than any other type of door they had used. He had tried all sorts of furnace bars—cast iron and pressed steel. He was now using steel plates, at the back end of which a piece of metal was electrically welded, thus giving more cant on the bars. They were rather more costly than the others, but were well worth the extra expense, because they worked perfectly, and some had been in the fire now for two years.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Presidential Address and Annual Dinner.

The First Meeting of the Session took place on Saturday, Oct. 13. During the afternoon a visit was paid to the Ideal Homes Exhibition at the Stow Hill Pavilion, in which many members took part. In the evening there was an assembly at the Talbot Hotel, where the Presidential Address was delivered after a dinner, which was provided by the Chairman and Directors of the Newport (Mon.) Gas Company. The gathering was one of the most successful the Association has enjoyed since its inception in 1922; and among those present were Mr. H. D. Madden, M.Inst.C.E.; Mr. J. H. Canning, O.B.E.; Mr. R. Wilson Bartlett (Director of the Newport Gas Company); Mr. D. W. Davies (Tredegar); and Mr. T. V. Blake (Manchester).

THE NEW PRESIDENT.

Mr. T. V. BLAKE inducted to the chair Mr. C. B. Felton, who becomes the President for the ensuing session. Mr. Blake said he hoped that Mr. Felton's year of office would be successful in every way.

Mr. FELTON briefly expressed his thanks.

ANNUAL DINNER.

The Loyal Toast was proposed by the PRESIDENT; and this was followed by the toast of "The President;" the proposer in this case being Mr. C. H. COLLINS (Junior Vice-President).

Mr. FELTON, responding to the toast, thanked the members for electing him to the chair, and said he hoped that at the termination of his office there would be no room for regret. Their thanks were due to Mr. Blake, the Past-President, who through force of circumstances had had to carry on for two years. He was pleased also to be able to congratulate Mr. Blake on his new appointment at the Bradford Road Works of the Manchester Gas Department.

Mr. B. J. BELL (Hon. Treasurer) then proposed the toast of "The Gas Industry," and made special reference to the Wales and Monmouthshire District Institution of Gas Engineers and Managers. Every effort was being made by the gas industry, he remarked, to give the public efficient service in the form of cheap power and heat. He emphasized the great assistance which they as juniors had received from the Senior Association at all times, and mentioned the education facilities of which many of the Juniors had availed themselves with ultimate success. It was a pleasure to realize that four of the Past-Presidents of the Wales and Monmouthshire Junior Gas Association had secured important appointments in various parts of the country. He coupled with the toast the Wales and Monmouthshire District Institution of Gas Engineers and Managers.

Mr. H. D. MADDEN, on rising to respond, received a great ovation. He said for the past five years he had been the Chairman of the Board of Examiners, and during that time he had seen what the Education Scheme meant to the juniors. The future of the gas industry was in the hands of the Junior Associations. With regard to the Wales and Monmouthshire Association, he was gratified at the high standard obtained; and it had been a revelation to him to hear the papers read by members of the Junior Association. He referred to the pressure which the industry was bringing to bear upon the Government in the shape of an Enabling Bill in order to remove some of the restrictions which impeded the progress of the industry. He had recently waited upon the local Members of Parliament, and had put the matter before them; and it was hoped that some response would be forthcoming from the Government in the near future.

Mr. J. H. CANNING (Newport) said he wished to associate himself with Mr. Madden's remarks. He paid tribute to Mr. Madden's abilities, and his untiring efforts put forward for the benefit of the industry, especially in relation to the Education Scheme. He (the

speaker) considered the work of the Juniors very important. Competition had become very keen, and it behoved every member of the Association to put his shoulder to the wheel, in order to keep the gas industry to the front.

Mr. T. Noall (Cardiff) proposed "The Newport Gas Company." He said he had watched the progress of the Company, and was acquainted with the name of Canning long before he entered the gas industry. He paid tribute to the executive officers, and said that the present Chief, Mr. J. H. Canning, was the worthy son of a worthy father.

Mr. R. Wilson Bartlett (a Director of the Newport Gas Company) responded.

PRESIDENTIAL ADDRESS

of C. B. Felton, of Newport (Mon.).

Competition is advantageous because it often creates the necessary stimulant for the purpose of advancement. Many schemes are being widely investigated for the production of a smokeless fuel suitable for the replacement of raw coal. The cause of these investigations may be attributed to the necessity of preserving the coal resources of the country, preventing the enormous waste of valuable substances which the burning of raw coal entails, and creating a healthy atmosphere.

Perhaps it is not generally known that each year approximately one hundred million tons of raw coal are used, and that the valuable constituents are poured into the atmosphere, and wasted. Even with a coal reserve of 180,000 million tons, this gigantic waste cannot lead to any other result than a final overdraft at the mines.

THE PRESIDENT,

C. B. Felton, of Newport (Mon.).

Educated at Porthcawl College and the Newport Technical Institute, Mr. Felton was articled to the late Mr. Thomas Canning, Engineer and Manager of the Newport Gas Company, in 1907, and was placed on the staff of the Company two years later. During the war, he served with H.M. Forces in France and in the East from 1914 to 1920, and attained the rank of Captain. At present Mr. Felton is Engineering Assistant to the Newport Gas Company.

When we consider that the total amount of coke available for use in the country is only equal to about 10 p.ct. of the total solid fuel used, it must strike us that there is plenty of room for economy. Who but the gas industry is best able to effect this economy The industry's engineers have had over one hundred years of valuable experience with all classes of coal, and it is due to their thorough investigation of the different methods of carbonization that there has been produced gas coke of the present high standard. Not only has the high-standard coke been made, but it has been widely marketed, and is at present considered an ideal fuel for steam raising, greenhouse and garage warming, bakers' ovens, central heating, steam road-transport, &c., and for use in steam rollers, open and closed stoves, and smithy forges.

I therefore consider that the problem of reducing the waste of raw coal will only be solved by the gas industry.

Systematic selection and blending of different classes of coal have led to the production of coke containing little ash—which is one of the essentials of the smokeless fuel of the future. The ash content depends on the amount of ash in the coals carbonized; and the latter should be regulated to give a constant ash content in the resultant coke. The temperature of carbonization—owing to the ease with which modern settings can be regulated—can be controlled at will.

The final operation in the manufacture of gas coke is responsible for the moisture content, which plays an important part in regard to ease of ignition. The quenching of coke necessitates every care if the moisture content is to be kept within reasonable limits; and it should be borne in mind that, where conveyors are used in connection with sprays, or where the coke is quenched by immersion in water, the quantity of water should be kept at a minimum. It is suggested that some form of covered storage might be adopted.

It would be foolish to suppose for a moment that the replacement of 100 million tons of raw coal by smokeless fuel can occur in a year or so. It will take a long time, but it will eventually be achieved. In the meantime, the figure can be reduced by educating the public regarding the benefits of using smokeless fuel. Publicity must be given to the many merits of coke, and practical demonstrations ought to be arranged. Nothing is more convincing than demonstration. Informative literature and free samples should be available.

Gas undertakings must be able to supply any grade or size of coke required, according to the type of apparatus which is to be used for this combustion; and the representatives of gas concerns should be able to give sound advice on this matter. Delivery should be carried out promptly.

In conclusion, I call your attention to a few of the many advantages of using gas coke:

The abolition of smoke and dirt from our atmosphere, giving place to the maximum amount of sunshine in the now crowded factory areas.

The creation of further export trade in residuals saved from the coal now wasted.

The saving of millions of pounds spent on the erection of unnecessary plant outside the gas industry.

The recovery for trade of the tar and ammonia now passed into the atmosphere.

Less household drudgery.

The sum of all the advantages is impossible to imagine, for even the first of those I have mentioned—the abolition of s noke and dirt from the atmosphere—would lead to hundreds of others.

Vote of Thanks.

A vote of thanks to the President was proposed by Mr. A. E. Martin, and seconded by the Hon. Secretary (Mr. H. S. Bartlett); and Mr. Felton responded.

The proceedings terminated with musical items.

THE INSTITUTION OF GAS ENGINEERS' EDUCATION SCHEME.

From Mr. Walter Hole (the Organizing Secretary) we have received for publication the following further list of successful internal candidates in connection with the 1928 examinations in Gas Engineering and Gas Supply under the Institution's Education Scheme. The previous list was published in the "Journal" for Sept. 5.

Bath Technical College.

Gas Engineering—Higher Grade.

Name.	Class.	Ancillary Subjects Taken.
Ashman, W. L.	2nd	Engineering Science, Physics, Theory of Machines, Structural Engineering.
Feltham, H. C.	2nd	Engineering Science, Physics, Theory of Machines, Structural Engineering.
Wardle, N. F. D.	2nd	Engineering Science, Physics, Theory of Machines, Structural Engineering.

Birmingham Central Technical College.

Gas Supply—Ordinary Grade.

Maskell, N. P.	2nd	Maths., Physics, Electrical Engineering for Gas Engineers.
Reilly, N. R.	2nd	Maths., Physics, Electrical Engineering for Gas Engineers.

Cardiff Technical College.

Gas Engineering—Ordinary Grade.

Name.	Class.	Ancillary Subjects Taken.
Cruise, A. J.	1st	Inorganic Chemistry, Organic Chemistry, Engineering Drawing.

Hull Technical College.

Gas Supply—Ordinary Grade.

Walker, F.	2nd	Maths., Chemistry, Heat Engines.

Westminster Technical Institute.

Pressley, C. D.	1st	Maths., Engineering Science, Technical Drawing.

The following candidates sat for examination in Ordinary Grade Gas Supply as a single subject in order to qualify for the Diploma examination in Gas Engineering:

Blackburn Technical College.

Pinder, A. H.	1st, with distinction.
Smith, W. N. H.	1st

PROBLEMS IN ATMOSPHERIC COOLING.

By G. J. GREENFIELD.

[Paper before the Coke Oven Managers' Association (Northern Section) on Sept. 29.]

This paper is simply a statement of practical difficulties which we have met at the Fell Coke Works, Consett, and the methods adopted to overcome them. I must say at the outset that these difficulties are caused by the fact that we operate regularly at 20 to 25 p.ct. above the capacity for which the plant was designed.

The water used for cooling is that supplied from the Consett Iron Company's central softening plant. It comes on to the plant by a 6-in. main, and, regulated by a float valve, flows into a basin where it mixes with the re-cooled water from the water-cooling tower, and is pumped to an overhead tank of 3000 gallons capacity, situated at the top of the benzole scrubbers. From here it feeds by gravity to—

(I.) Atmospheric coolers:
  (*a*) Gas coolers;
  (*b*) Wash-oil coolers.

(II.) Non-atmospheric coolers:
  (*a*) Crude benzole dephlegmator and condenser;
  (*b*) Rectified benzole dephlegmators and condensers;
  (*c*) Ammonia still dephlegmator.

The water, heated to various temperatures (ranging from about 20° C. leaving the wash-oil coolers and secondary gas coolers to over 60° C. from the benzole house), returns to the water-cooling tower by gravity, except in the case of the wash-oil cooler water, which is pumped.

The problems met with are:

(1) To cool the gas and wash-oil efficiently during the summer and in damp weather;
(2) To re-cool the cooling water.

GAS COOLING.

The gas leaving the ovens is first cooled to about 280° C. by liquor sprays on the ascension pipe valves. In the long offtake mains (whose total length is 450 ft. and area 3900 sq. ft.) it is cooled atmospherically to 90° C., at which temperature it enters the primary coolers. These consist of 60 serpentine pipes in parallel. Each pipe is 6 in. in diameter, and the total area of the pipes is 23,600 sq. ft. There are ten sections of six pipes each, and each pipe is a serpentine of twelve passes.

Water is sprayed on to the pipes, and falls into a concrete basin beneath, from which it flows by gravity to the top of the water cooling tower.

The original arrangement provided eight atomizing sprays to each bank of 6 in. gas serpentines. These sprays are 2 ft. 11 in. above the top of the gas pipes, and in windy weather, owing to the fact that our hill-side location gives an upward cast to the wind, much of the water never reached the gas pipes at all. We therefore provided an equal number of plain jets, formed by ⅛ in. holes in ordinary screwed plugs. These are situated 10 in. above the gas pipes, and the water is distributed by the force with which it strikes the topmost pipe. This gives more water than the atomizing sprays, but distributes it less efficiently over the gas pipes. At present we use the atomizing sprays in still weather, when good distribution is required, and the straight jets in windy weather, when it is most important to get the water on to the pipes without its being blown away; distribution then being a secondary matter. In the height of summer, both "sprays" and "jets" have to be used together.

It may be of interest at this point to mention some observations we have made as to the effect of scale on the efficiency of this type of cooler. When the coolers were coated with scale between ⅛ in. and ½ in. thick, we took some measurements from which we deduced the following coefficients of heat flow (the units being B.Th.U. per sq. ft. of cooling area per hour per 1° Fahr. temperature difference):

Theoretically calculated	8·25
Actually obtaining	10·90

In the theoretical calculation, the scale was ignored. In spite of this, the figure actually obtaining is the greater. This suggests either that there is something wrong with the theory, or that scale has no practical effect. After this test, five out of the ten sections of pipes were cleaned of scale.

On taking the temperature at the outlet of each section, we found on a certain day;

Gas entering all banks		79° C.
Gas leaving	five banks cleaned of scale . .	26° C.
	,, ,, not cleaned of scale.	25° C.

(There was a good west wind on the day in question.)

These temperatures show that the removal of scale from these coolers has no effect on their efficiency. The reason is not far to seek. The heat in flowing from the gas to the atmosphere has to pass through a number of resistances in series. These are:

(1) The gas film on the inside of the pipe.
(2) The metal of the pipe.
(3) The scale on the pipe.
(4) The water film on the outside of the pipe.
(5) The air film on the outside of the water film.

Of these, the resistance of the air film is so great that all of the others are negligible by comparison. This also points out the importance of wind action, since the air film will become thinner as the wind velocity increases.

WASH-OIL COOLING.

Wash-oil, at the rate of 3300 gallons per hour, leaves heat exchangers at about 80° C., and passes through six banks of cooling tubes, having a total area of 4480 sq. ft. Water is allowed to flow over the outside of the tubes from perforated pipes. During warm weather, the temperature of the re-cooled water is often above 20° C., with the result that, in the absence of wind, the oil cannot be cooled below about 28° C. As the temperature of the softened water supplied to the plant is seldom more than 12° C. (except in summer, when it has reached a maximum of 17° C.), we led water from the supply pipe to the cool end of the wash-oil coolers, with valves, so that it could be fed on to one, two, or three banks as required. This was the end of trouble in cooling our wash-oil; but as the amount admitted to the system at that point was now sometimes more than was required to make up the evaporation losses of the system, we have to put up with the loss of some water down the drain.

We are now adopting a slotted pipe instead of the perforated pipes formerly used. This consists of 1¼-in. diameter mild-steel pipe with a slot ½ in. wide extending the whole length of the pipe. It is set about ½ in. above the topmost pipe of the bank of pipes to be cooled, with the slot facing upwards. The water is fed into the middle of the length, and overflows along the whole length of the slot. Each slotted pipe has to be carefully set with the aid of little packing pieces, for, when left absolutely level, the water does not overflow evenly. This method of distribution has already been successfully applied to the wash-oil coolers, and is now being prepared for installation on the gas coolers, from which both the "sprays" and the "jets" will be removed. We find that the narrower the slot, the less efficiently is the water distributed along its length.

The advantages of the slotted pipe are: (1) It never gets clogged up, as perforations do; (2) it distributes the water more evenly; (3) it is simpler to fit up, and neater in appearance, than a wooden trough.

COOLING THE COOLING WATER.

The other problem is that of getting the cooling water properly cooled. The cooling tower is of the grid or hurdle type, and has the following dimensions: Length 50 ft., width 13 ft., and height 14 ft., with 12 layers of grids. Water distribution at the top is effected by a main trough of galvanized iron, feeding by ¾ in. pipes to the centres of 45 parallel wooden troughs. From there it overflows at **V** notches ⅜ in. deep and 2¼ in. apart, in the two sides of each trough.

All atmospheric types of water cooler depend for efficient cooling upon an adequate movement of fairly dry air. In damp "muggy" weather, the atmosphere is already saturated with moisture; and in addition that kind of weather is often accompanied by absence of wind. We are therefore doubly in trouble under those conditions, because we depend upon the atmosphere on the one hand for cooling the gas and on the other for re-cooling the cooling water.

In the first place we found that the water dripping near the sides of the tower was often 5° to 10° C. cooler than the general average of the pond beneath the tower, showing, as one would expect, that the best cooling occurs at the sides. Owing to the fact that the troughs are horizontal, and the **V** notches all of equal depth, more water descends the middle of the tower than at the sides. By slightly raising the centres of the troughs, we have visibly improved the distribution, and the work of cooling is much more evenly spread between the centre and the sides of the tower.

In warm weather, it sometimes happens that the temperature to which the tower will cool the water is not low enough to enable the water afterwards to cool the gas. In this case we turn the hottest water, or part of it, into the drain. This source is the hot water from the various condensers in the benzole house. This procedure sounds wasteful on a plant where water has to be bought, but it pays to keep the gas cool even by this means, because of the decreased efficiency of benzole and tar recovery, which occurs as soon as the temperature rises.

A cooling tower of this type, depending on natural wind movements, must be placed in an exposed position. This state-

ment is surely so obvious as to be almost unnecessary. I mention it because of the situation of our tower.

The lay-out is very simple. All heated water, returning from all the different cooling apparatus, flows by gravity on to the top of the tower. Thus the hillside location has been utilized, and the cost of a pump has been saved. The tower is exposed broadside to the prevailing west wind, with no obstructions, and even a north or south wind cools satisfactorily. When the wind lies between N.E. and S.E., the hillside, the battery, and other buildings obstruct the wind, so that the water cannot be cooled. Even the gas coolers, which are higher up than the tower, are screened. Consequently we have experienced most bitter wintry weather, during which, owing to the east wind, neither the gas nor the water could be cooled.

May I conclude with the remark that there is a certain type of paper the discussion upon which is more valuable to the meeting than the paper itself. This paper is intended to be of that type.

Discussion.

The CHAIRMAN (Mr. J. Curry) remarked that he had seen water cooling towers of the chimney type in Holland and also at the Coventry Gas-Works, and he understood that they were very efficient. The advantage of the chimney type over that installed at Mr. Greenfield's plant was that it was independent of the wind. Referring to the author's statement on the effect of scale on his cooler, he inquired whether the gas and water were measured on to the different sections of the coolers. The most striking feature of the paper was the claim that the efficiency of the coolers was not affected by scale. This seemed almost incredible; and he hoped Mr. Greenfield would be able to give some further information about it.

Mr. T. B. SMITH inquired whether the scale was that precipitated from the water, as it occurred to him that the extra cooling might be due to oxide of iron, which would present a larger surface.

Mr. E. M. MYERS pointed out that the conductivity of the scale was considerably less than that of the iron of which the pipes were made; and it seemed to him incredible that the scale would have no practical effect.

Mr. A. H. THWAITE said he had a serpentine cooler on which water was sprayed, and he had found a considerable improvement in his cooling efficiency after removing the scale which had been deposited. He remarked that with a cooling tower of the same type as that described by Mr. Greenfield he had considerably improved its efficiency by totally enclosing the sides, thus making it in effect a chimney type of tower. With regard to scale, he thought it was possible that there were certain critical temperatures at which scale was deposited, and that by regulating the amount of cooling water on different parts the scale could be localized.

Mr. W. FORSTER remarked that he had wash-oil coolers which were cooled partly by water sprayed on the outside, and partly by water flowing through tubes within the oil tube. After removing the scale from the outer tubes, he found that cooling was more efficient, and also after cleaning the oil side he found that the efficiency was increased.

THE AUTHOR'S REPLY.

Mr. GREENFIELD, in reply, said that they were unable to measure the gas and water separately on the different sections of the coolers; but as the ten banks were in parallel, and similarly placed with regard to the inlet and outlet mains, he felt justified in saying that approximately the same amount of gas and water served each bank. In any case, it would be noticed that the outlet temperature figures which he had mentioned were the averages for the five sections scaled and the five sections not scaled. He did not attach any importance to the difference of 1° C. between the two figures. He regarded them as being equal.

He realized that he had stirred up a hornets' nest by saying that scale had no effect. This, in fact, was why he had come to the meeting. By means of a blackboard sketch, he explained that the heat, in travelling from the gas to the atmosphere, had to pass through several resistances in series. First the gas film on the inner surface of the tube, second the metal tube, third the scale, fourth the water film on the outside of the scale, and fifth the air film on the outside of the water film. These films might or might not be real films of stationary liquid or gas; but it was fairly certain that they were real films, though of unknown thickness, inasmuch as the conductivity under similar conditions was found to be proportional to the conductivity of the fluid in question. He explained that, instead of the resistance, the conductivity was usually given; the units being B.Th.U. per hour transferred through 1 sq. ft. of the cooling area for each 1° Fahr. temperature difference between the inside and the outside of the film or other resistance. Thus, let h_g be the conductivity of the gas film, k_m the conductivity of the pipe, $\frac{k_s}{L}$ the conductivity of the scale, h_w the conductivity of the water film, h_a the conductivity of the air film. The term h_v could be used to represent in similar units the rate of conduction of heat from the gas to the inner surface of the metal pipe by reason of the condensation of vapour. Let H be the over-all conductivity of the arrangement. The reciprocals of these quantities were naturally the resistances. Conduction of heat through a number of resistances was closely comparable to the conduction of electricity. As these resistances were in series, they could be added, excepting that h_g and h_v were in parallel, and so those conductivities were added. Thus,

$$\frac{1}{H} = \frac{1}{h_g + h_v} + \frac{L}{k_m} + \frac{L}{k_s} + \frac{1}{h_w} + \frac{1}{h_a}$$

The following were approximate values, partly calculated from well-known formulæ, and partly assumed:

$$h_g = 128;\ h_v = 2000;\ \frac{k_m}{L} = 1200;\ h_w = 300;\ \text{and } h_a = 8{\cdot}5.$$

The reciprocals of all these were negligible by comparison with the reciprocal of the last, 8·5. Thus H was nearly the same as h_a, and so the air film was the controlling resistance of the arrangement. The whole of the formulæ and assumptions on which the above figures were based were found in "Principles of Chemical Engineering," by Walker, Lewis, and McAdams—a standard treatise. He admitted that he did not know what the conductivity of the scale was. This, in fact, would depend upon the conditions under which it was deposited; and probably no published data would be of any great value. Certainly it would be different from the conductivity of boiler scale, though similar in chemical composition. They must realize that the figure for L in feet was only $\frac{1}{48}$ (*i.e.*, $\frac{1}{4}$ in.), so that, even if k_s was very low, the value of $\frac{k_s}{L}$ was not likely to be less than one or two hundred; and consequently he felt justified in saying that the scale, along with the other resistance, was negligible by comparison with the air film. They must remember that very few solid substances had conductivities as low as that of an ordinary gas. The value of 8·5 for h_a had been calculated on the basis of a 10 m.p.h. wind. Probably their wind velocity had been underestimated, which would account for the actual value of H being higher than that calculated.

Mr. THWAITE: Would you object to the tubes being made of a poorly conducting material?

Mr. GREENFIELD: Not in the least, provided they were as thin as the scale is on my tubes.

Proceeding, Mr. Greenfield said that, of course, scale was of vast importance in boilers, where they had rapidly moving gases on one side of a thin metal tube, and very rapidly moving liquids on the other side. Naturally, the gas or water film would be thinnest where the velocity was greatest; and in a properly designed boiler the films were so thin that a thin layer of scale would have a considerable effect.

Mr. T. B. SMITH remarked that he felt at first that the paper meant that the manager who was most slovenly in regard to cleaning his coolers would be the most efficient; but he could not but admit that Mr. Greenfield had convinced him with regard to his own particular type of cooler. It did not follow that scale had no effect in other cases.

VOTE OF THANKS.

Proposing a vote thanks, Mr. MYERS said they were deeply indebted to Mr. Greenfield for some very interesting figures and for having stimulated a very keen discussion. Mr. THWAITE seconded.

In reply, Mr. GREENFIELD said he was fully repaid by the fact that he had been able to stir up a discussion. Scale had been the bone of contention, and what he had been able to tell them was a useful illustration of the fact that neither theory nor practice was much good by itself, but that the real thing was the application of theory to practice.

FLUID-TIGHT FERRO-CONCRETE GAS PURIFIERS.

By P. N. ROY, A.M.I.Struct.E.

[From the "Structural Engineer" for October.]

During the war, when steel for structural use was almost unobtainable except for war requirements, ferro-concrete received a great impetus in this country. Apart from its use in buildings, bridges, bunkers, and general structures, ferro-concrete was tried in the construction of ships, oil tanks, and gas purifiers. The peculiar problems involved in the construction of these fluid-tight vessels gave rise to a band of pioneers, all of whom excepting one confined themselves to water-tight work required in ferro-concrete ships and oil tanks. The exception was Dr. B. N. Dey, D.Sc. (Engineering), who continued his pioneering work and convinced gas engineers of the efficiency and durability of gas purifiers built in special fluid-tight ferro-concrete as developed by him. Numerous purifiers were erected on Dr. Dey's system throughout the country, and proved not only equally efficient and more durable, but 33 to 40 p.ct. cheaper in first cost than the cast-iron purifiers, as in the case of the £200,000 gas purifier installation at the Provan Gas-Works of the Glasgow Corporation, who saved £80,000 by adopting Dr. Dey's designs.

It is not possible here to deal with the many features of design and construction which go towards making concrete absolutely fluid-tight, and the reader is therefore referred to Dr. Dey's thesis (based on seven years' research and results of actual construction) on water, oil, and gas tight ferro-concrete tanks, for which he was awarded the Doctorate of Science (Engineering), Glasgow University, who recognized his as original and pioneer work. It affirms the necessity for correctly incorporated reinforcements, pronounces against the use of surface dressings as being merely palliatives, emphasizes the importance of grading of aggregate and special proportions of the concrete mixture, and advises the use of comparatively large panels of thick slab.

Illustrating his article by two typical cases of purifiers, the author explains that mild-steel covers with rubber joints are used. Ferro-concrete would not be practicable, owing to excessive weight. The tanks are designed to withstand internal pressure of 60 in. water gauge, and support 330 lbs. per sq. ft. of oxide spread on the grids, and the mild-steel covers.

The test of service rendered by these gas purifier tanks has clearly shown that water, oil, and gas tight tanks can be made efficiently in ferro-concrete, cost less in capital charges, cost nothing for maintenance, and have practically an indefinite life.

AN INDUSTRY UNITED FOR PUBLICITY.

By W. M. MASON, General Manager of the British Commercial Gas Association

[Extracts from an Address before the Bradford Publicity Club on Oct. 16.]

The experiment of endeavouring to unite an industry for publicity and propaganda purposes is something so out of the ordinary that a brief outline of how it has been successfully accomplished by the British Commercial Gas Association should prove of interest to advertising men anywhere.

It is of historical value to record that the British Commercial Gas Association was the first serious experiment in co-operative publicity in this country. Several other important industries have followed the lead, and have generally proved equally successful. Other industries might profitably consider the advantages and economies to be derived from co-operative effort. The whole subject is certainly worthy of serious consideration. The object of this paper is to show how an industry, with over 100 years' experience of active business life behind it, and rightly claiming to be national in every sense of the term, has, through the pooled brains of its most progressive business managers, in co-operative effort, become a very material factor not merely in promoting its own welfare, but in moulding public opinion and educating the people as to the wonderful servant gas is, and can be in an increasing degree, in the domestic, business, and civic life of the community.

No small part of the Association's activities has been the moulding of public opinion in relation to public health, particularly as regards air pollution by smoke. The possibilities for service of a national association combining for one common ambition and taking large and small, influential as well as isolated and scattered, units in one powerful organization, is more appreciated to-day than it was sixteen years ago when the Association commenced its activities.

In an old and honourable business, holding, as it does, a wonderful record of over a century of public service, it was not so easy to demonstrate the need for the adoption of the salesmanship methods demanded by newer commodities. The fact that the gas industry held such a remarkable engineering record by which had been gradually built up a great public utility service, coupled with safety, and a "reliability which never failed"—to quote a well-known Government official—was not, as may be imagined, the easiest industry hopefully to consider the necessity for the application of modern publicity methods, if its business was to be retained. The spur of competition has very effectively helped to stimulate action.

Even to-day, however, some members of some gas committees, and even some directors of gas companies, think and say that surely, after a hundred years, everybody with any intelligence knows about gas, whereas the facts are that while many now know about the domestic side of gas supply, there is still colossal ignorance which can only be overcome by modern sales methods and educative publicity. Salesmanship practice does not, of course, stop at advertising. It includes, in the speaker's opinion and experience, the complete circle of regular quality gas, adequate pressure on the districts, first-class showrooms in the best parts of the town, trained and competent salesmen, the supply and fitting of sound and reliable apparatus, as well as the inspection and maintenance of appliances to see that they continue to retain the satisfied and happy consumer.

As far back as 1907, Mr. F. W. Goodenough, the Controller of the Sales Department of the Gas Light and Coke Company (who has just been signally honoured by being elected Chairman of the Advisory Committee on Training for Salesmanship, set up by the Board of Education), in a paper read before The Institution of Gas Engineers, emphasized the necessity for developing the sale of gas on modern lines; but it was not until October, 1911, that the "B.C.G.A." was formally launched, and in March, 1912, began active service "to promote the commercial prosperity of the gas industry by co-operative action," as the constitution happily expresses it. The faith of the leaders of the movement in the soundness of their principles, as well as their belief that the real business sense of the gas industry would ultimately endorse their policy, have been fully justified.

Though commencing in a comparatively small way, the principles for which the "B.C.G.A." has steadily contended have become generally recognized as sound, and the actual policy and operations of the Association have been conducted in such a broad-minded, progressive spirit that now 95 p.ct. of the total gas industry in the United Kingdom, as measured by output, is, with the official Association of the manufacturers of gas apparatus, actively linked together in the co-operative movement. The Executive's policy of peaceful persuasion by accomplished fact is steadily making for complete unity of effort. A number of overseas undertakings, realizing the value of such an Association, particularly on the service side, are also active members. It is a matter for very sincere congratulation to the Executive, as the finest possible testimony to the industry's appreciation of their work, that, as regards both membership and financial support, even during the trying war period, the Association has never gone back, but has steadily gone forward. Money talks, particularly as an endorsement of policy, in a very emphatic manner.

The organization is designed on broad and national lines; the United Kingdom being divided into districts which, in turn, appoint representatives according to the total amount of subscriptions contributed by each district. Individual subscribers have, in addition, the right to nominate representatives as members of the Association on a scale based on contribution, but limited to a total of twelve representatives. There is also an international membership for individuals connected with the gas industry overseas.

AIMS OF THE ASSOCIATION.

The ultimate aim of the Association is, put briefly, to increase the sale of gas throughout the British Empire. It seeks to achieve this end by employing such methods of publicity as its means permit for making better known to the public the many uses and advantages of gas, and for overcoming those lingering prejudices against its use which are founded upon out-of-date beliefs and unsatisfactory experience of obsolete appliances and methods that have now little relation to modern conditions. The gas industry realizes that it holds the solution to many domestic and civic problems, and that good, wise, and persistent publicity will steadily educate the public to this way of thinking.

It is realized that local effort can do, and has done, much in this direction; but local effort, however excellent, cannot possibly do all, or nearly all, that needs to be done to defend as well as to develop the best interests of the industry. The Association, moreover, aims not only at augmenting local by national publicity work, but also at being of material assistance in the carrying-on of local campaigns by placing the services of first-class advertising experts within the reach of all, and by providing the individual undertakings with high-class advertising matter at wholesale prices.

When it is said that local effort cannot possibly do all that needs to be done to forward the interests of the industry, we have in mind particularly the necessity of centralized efforts for dealing with and informing educational, medical, architectural, sanitary, and other authorities, to say nothing of municipal and Government departments—work which may be, and is, of widespread and incalculable value, but which obviously cannot be adequately undertaken by any one company or corporation. The Association is the centralized medium by which members make their expenditure on advertising more remunerative and effective.

No individual gas undertaking, however large, could afford to advertise in all or even a small section of the national publications, yet no one (certainly no publicity man) will deny that advertisements in papers and periodicals of national repute and widespread circulation attract the attention of customers whose orders and goodwill are worth spending money to secure. To do so would be to deny wisdom to all the leading manufacturers and big business people in the civilized world. Only in that way can the interest of many potential customers be secured in the claims of gas to consideration by the householder, the manufacturer, the doctor, and the educationalist. Gas service is capable of helping mankind at every point from the cradle to the grave; but there are still many who are ignorant of its value.

The national advertisements of the "B.C.G.A." attract, interest, and convince thousands of people who have not been convinced by local effort, however thorough and capable that local effort has been. The public regard, and rightly regard, the advertisements of the Association as representing the best possible up-to-date information respecting the possibilities of gas in the home and place of business.

It is not only public ignorance of a negative kind about gas that we have to remedy. There are public prejudices against gas based upon inaccurate information and out-of-date or badly fitted apparatus with which we have to deal, and which the national campaign of the Association has already done much to remove.

The outstanding point in Association policy is well worthy of consideration. It is on positive rather than negative lines—a policy of *pro* instead of *anti*. It is always a temptation to hit back when attacked—it certainly is so if you have Scotch blood in your veins—but it is much wiser, as a rule, to "get on with your job." The "B.C.G.A." "big guns" are all *pro* gas.

RESULTS.

In this necessarily brief outline of the Association's work, it has been impossible to do more than sketch very lightly the general lines of co-operative policy and methods. No attempt has been made to go into detail, though many of the side-lines in connection with our work and service to members are

fascinating. Some one may ask, "But what about the results from all this co-operative effort?" Despite an unchanged coal consumption, the gas industry is able to reveal an average annual growth of

3144	million	c.ft.	for	the	years	1884	to 1894,
5042	,,	,,	,,	,,	,,	1895	,, 1904,
5655	,,	,,	,,	,,	,,	1905	,, 1913,
4940	,,	,,	,,	,,	,,	1914	,, 1924,

while during the last three years the average rate of increase has been no less than 11,000 million c.ft. per annum. The use of gas is actually expanding, therefore, at a steadily increasing rate—a certain sign that it is far from reaching saturation point.

The real value of publicity and good service cannot, of course, be judged either by the number of direct inquiries resulting, or by its popularity, any more than by the envy with which it is viewed by competitors. It can only be proved truly successful by the steady increase in business it helps to foster, as well as by the retention of satisfied customers. We do not for a moment claim or suggest that publicity—in the gas industry or anywhere else—is a fairy wand that will, unaided, work wonders. Publicity will never act successfully merely as a substitute for good all-round service. "Quality, price, and service are the cardinal virtues of successful trading;" the greatest of these is service, and publicity forms an essential factor in that great business virtue.

The Future.

New ideas are stirring throughout the gas industry in this country, fresh life-blood is coursing through its veins, activity is evident in every direction, and last, but by no means least, the spirit of co-operation for mutual benefit, both between one gas undertaking and another, and between the makers of gas on the one hand and the manufacturers of appliances on the other, is growing steadily every day, and is becoming a mighty compelling and propelling force in the old gas chariot.

In the creation and fostering of this good spirit, the British Commercial Gas Association has played, and must increasingly play, a leading part. The combination is certainly not, either in intention or in fact, designed—as so many big trust and industrial combines appear to be—to exploit the long-suffering public. It could not, even if it would, as it is hedged about by many safeguards. No industry can more honestly claim to have been freer from the vice of profiteering. The ideal is rather, as we have stated, the high ambition to give the best possible service at the least possible cost.

REGISTER OF PATENTS.

Treatment of Carbonaceous Matter.—No. 296,793.

Dvorkovitz, P., of Cambridge Gardens, W.

No. 6453; March 8, 1927.

This invention relates to apparatus for use in the process of treating coal, and other carbonaceous matter, described in patent No. 192,816 [see "Journal, Vol. 162, p. 43], whereby oils of the paraffin series are obtained.

The apparatus comprises a retort which is mounted upon a similar retort; valvular means being provided whereby the retorts can, when desired, be put into communication, so that the residue in the upper retort can pass into the lower retort for further treatment. Means are also provided whereby each of the retorts is externally heated, and whereby preheated gas is admitted thereto; and this may be effected in the same, or substantially the same, manner as described in the earlier patent.

When a charge of carbonaceous material contained in the upper retort has been treated, and the required light oils obtained therefrom, the valve or valves between the retorts is or are operated so that the residue in the upper retort passes into the retort beneath it, where it is subjected to a temperature in accordance with the products to be obtained—such, for instance, as the heavier oils of the paraffin series.

The upper retort, and also if desired the lower retort, may be provided with means whereby the contents, during treatment, or at intervals during treatment, can be subjected to mechanical agitation, or loosening-up, in such manner that the contents are very efficiently subjected to the heat applied to the retort, or retorts, and the process thereby expedited and generally rendered more complete and efficient.

The vapours pass from the retorts to a series of condensers from which the products of condensation can be removed separately, as desired.

Gas Meters.—No. 296,804.

Bingham, J. H., of Harrow.

No. 15,146; June 7, 1927.

This invention relates to gas meters of the bellows type, and more particularly to an improved arrangement of the bellows pans and their connection to gas supply and discharge conduits, and to an improved arrangement of the valves and valve operating means controlling the flow of gas through the meter.

By it, a gas meter is provided comprising a central gas-free box with bellows pans made integral with, or attached to, its exterior walls, and admission and exhaust manifolds connected by separate conduits to each bellows pan; gas being admitted to one side only of flexible diaphragms closing the bellows pans, and each conduit being provided with an independent obturator or valve. The admission and exhaust manifolds have ports therein successively opened and closed by obturator plates or balls successively opened and closed by rotary members receiving motion from the bellows.

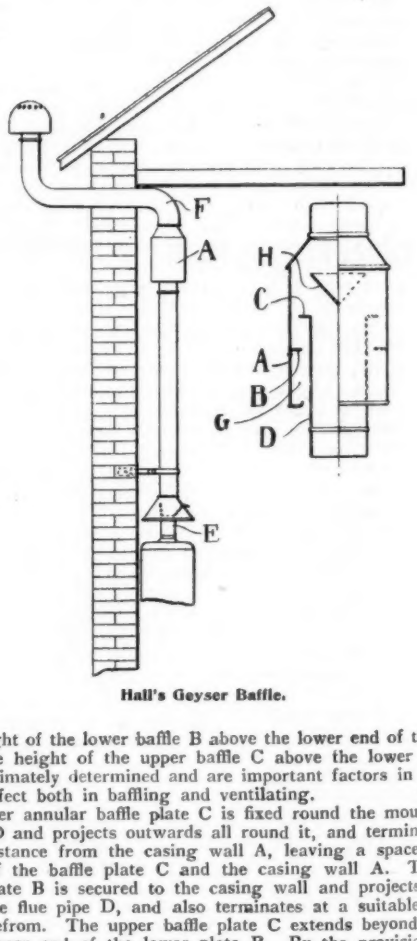
Bafflers and Ventilators.—No. 296,851.

Hall, C. L. & D., both of Bristol.

No. 18,314; July 9, 1927.

This invention relates to down-draught bafflers and ventilators of the type comprising a casing surrounding the upper end of the flue pipe; this casing having its lower end open to the atmosphere and its upper end projecting above the end of the flue pipe and having a discharge pipe in axial alignment with the flue pipe.

The general arrangement of the proposed new appliance and a detail are shown in the drawings which we reproduce. It will be seen that it comprises an outer casing A, a circular baffle plate B being provided at a suitable height above the lower end of the casing; and at a suitable distance higher up, a further baffle plate C, similar to the lower one, is fitted. Both B and C are disposed between the casing shell A and the flue pipe D by which the products of combustion from E are conducted.



Hall's Geyser Baffle.

The height of the lower baffle B above the lower end of the casing A, and the height of the upper baffle C above the lower baffle B, are approximately determined and are important factors in affording the best effect both in baffling and ventilating.

The upper annular baffle plate C is fixed round the mouth of the flue pipe D and projects outwards all round it, and terminates at a suitable distance from the casing wall A, leaving a space between the end of the baffle plate C and the casing wall A. The lower annular plate B is secured to the casing wall and projects inwards towards the flue pipe D, and also terminates at a suitable distance apart therefrom. The upper baffle plate C extends beyond or overlaps the inner end of the lower plate B. By the provision of the baffle plates B and C in the space G between the flue pipe D and the casing wall A, down-draught in the said space is baffled. Above the uppermost baffle plate is the usual inverted cone H over the mouth of the flue pipe D.

Instead of being secured to the casing wall, the lower baffle plate may be fixed to the stays which hold the upper part of the flue pipe.

Gas Lamps.—No. 296,888.

Foster & Pullen, Ltd., and Gill, A., both of Bradford.

No. 22,413; Aug. 26, 1927.

This invention relates to inverted incandescent gas lamps where a descending supply pipe connects to the burner or burners; and it is

proposed to combine with the gas supply pipe a **T** connection having horizontal branches right and left from which suitable connections are made to the burner or burners. These branches are closed at their ends by plugs, so that a wire or the like may be passed through the branches and **T**-piece and clear out any deposit. Where the deposit is light, the straight horizontal pipes may be cleared by blowing therethrough.

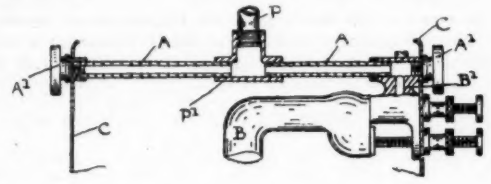


Fig. 1.

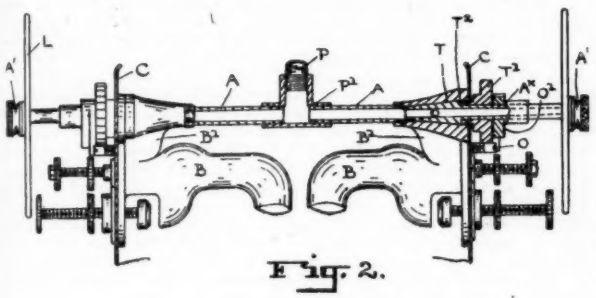


Fig. 2.

An Easily Cleaned Lamp.—Messrs. Foster & Pullen.

Fig. 1 shows the invention applied to a single burner; fig. 2 to a double burner. The burners B are of any usual or convenient design, but the depending gas supply pipe P, instead of being connected by an elbow or elbows, terminates in a hollow **T**-piece P^1 (inverted), and horizontal branches A lead right and left and pass into the casing C; suitable vertical connections B^1 leading from one or both branches to the burner or burners B. The open ends of the branch pipes A are closed with plugs, A^1 A^1, on removal of which the pipes and **T**-piece may be blown through or cleared by the insertion of a rod. In fig. 1 the control is from a suitable cock on the pipe P. One or both end plugs may for some forms of burners comprise a plug tap T having a hollow spindle A^x closed at the end by a removable plug to give the straight passage for cleaning.

In some types of lamps, such as are illustrated in fig. 2, the burner B is in duplicate to enable one or other of the burners to be turned off; and this type will have plug taps arranged as before described. To enable same to be accurately set to give ease of turning and a correct turning movement by the operation of a suitably shaped lever L, some form of setting is desired; and to this end a plug tap T enters a way in the burner B or branch B^1 thereof, which way is in alignment with the horizontal pipes A. The plug tap will have its centre and spindle A^x hollow, and the end carrying a lever L which is secured in position by a fitting or plug A^1, which also serves to close the open end. Around the spindle A is loosely mounted a gland fitting T^1 screwed to engage the burner fitting and to press on to a shoulder T^2 on the plug T. As this gland is screwed home the plug is forced into its seating; and to ensure correct locking of the gland, it has a series of serrations into one of which the stop pin O will be engaged. The usual stop member O^1 to abut against the pin in the open and closed position is carried by, and turnable with, the plug tap spindle A^x.

Lighting Control.—No. 297,071.

ALDER & MACKAY, LTD., and ANDERSON, J., both of Edinburgh.

No. 15,707; June 13, 1927.

The object of the present invention is to provide an improved or modified mounting for the time dial of a clockwork controller. The invention consists in a time dial assembly with a metallic spring washer and a flexible (such as a leather) washer in combination with a nut or the like for holding the time dial securely in position with reference to an operating shaft, and yet enabling the dial to be moved on the shaft for setting purposes without unduly releasing the tappets or arms by which the lighting and extinguishing of gas are effected.

The following elements or their equivalents are comprised: A central screwed spindle, a nut for the screwed spindle, a washer, a tappet arm, a second washer and a second tappet arm, and a time dial with a recess containing a thin nut adapted to screw on to an internally screwed piece which itself screws on to the aforesaid screwed rod, and on which the tappets are carried; this screwed piece being provided with a base carrying a metal spring washer and a leather washer.

The claims cover the complete timing mechanism.

Governors.—No. 297,166.

SIMPSON, J. F., of Scunthorpe, PEEBLES, W. C., and PEEBLES & CO., LTD., both of Edinburgh.

No. 17,506; July 1, 1927. No. 9628; March 30, 1928.

This invention has for an object to provide improved means for effecting automatic loading of a governor in dependence on the demand for gas—*i.e.*, for increasing or decreasing the outlet pressure according as the demand is increased or decreased or in any particular way. It consists broadly in a self-loading gas governing device comprising, in combination with a main governor including a member movable in a vessel which on one side of the movable member has a relief opening, a liquid container movable with said member, an auxiliary governor controlling the passage of gas from a point on the inlet side of the main governor to the interior of said vessel on the same side of the movable member as the relief opening, and means adapted to be buoyed by the liquid on the ascent of said member determining the operation of the auxiliary governor.

In one form there is adjoined to a main governor, including a diaphragm or a bell movable in a vessel containing water or other liquid, an auxiliary governor having its inlet open to the inlet side of the main governor and its outlet connected to the interior of the vessel above the diaphragm or bell.

In an alternative construction, the outlet of the auxiliary governor is connected to the interior of the vessel below the diaphragm or bell. The auxiliary governor may be, for example, a diaphragm or a mercurial governor. Carried by the spindle of the main governor is a cup of mercury which rises and falls with the movable member of the main governor, and into which may dip a rod or other member attached to a lever for determining the operation of the auxiliary governor; said rod or member being so shaped as on partial immersion to displace a quantity of mercury, increasing gradually or in stages by predetermined increments so as to bring about gradual or step-by-step variation of the effective load on the auxiliary governor—it being understood that as the main governor spindle rises in the closing movement of the main governor valve the dipping rod or member is buoyed to a corresponding extent by the mercury. An outlet connection from the top of the vessel aforesaid is taken to the atmosphere, or to a lamp burner, or to a low-pressure main subject to a constant pressure less than the minimum pressure for which the main governor is set, or to the outlet side of the main governor. When the auxiliary governor load is reduced, the pressure on one side of the main governor diaphragm or bell will also be reduced.

The device presents the advantage that the gas pressures inside and outside the main governor bell are nearly alike, so that the depth of seal required is reduced to a minimum. A further advantage is that the amount of variation of pressure from the main governor is limited only by the difference between the inlet pressure to the governor and the maximum outlet pressure required. The invention is applicable not only to governors for direct or actual loading, but is also applicable to devices for relay governing.

In the last-mentioned adaptation of the invention gas from the auxiliary governor may pass to the interior of the closed vessel below the main governor bell; the space in said vessel above the bell being exposed to atmospheric pressure. With this arrangement, should the outlet pressure tend to rise, the auxiliary governor shuts, and pressure builds up under the bell, closing the main governor valve. The converse takes place should the outlet pressure tend to fall.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 10.]

Nos. 28,026—28,800.

BISSELL, W.—"Gas cocks." No. 28,482
BLINCOE, C. F.—"Gasholders." No. 28,551.
CAMPBELL, J. M.—"Gas fires." No. 28,686.
CLARK, J. G.—"Couplings for pipes." No. 28,669.
CLARK, J. G.—"Geysers." No. 28,670.
COMPAGNIE POUR FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ.—"Gas meters." No. 28,563.
GAS LIGHT AND COKE COMPANY.—See Clark, J. G. No. 28,669.
GAS LIGHT AND COKE COMPANY.—See Clark, J. G. No. 28,670.
KEMPTON, C. H.—See Bissell, W. No. 28,482.
LANGER, R.—"Thermostatic controls for gas burners." No. 28,773.
MACLAY, J. A.—"Gas fires." No. 28,690.
MAIN, LTD., R. & A.—See Campbell, J. M. No. 28,686.
MAIN, LTD., R. & A.—See Maclay, J. A. No. 28,690.
MILLET, L.—See Compagnie pour Fabrication des Compteurs et Material d'Usines a Gas. No. 28,563.
WORTLEY, G. W.—See Campbell, J. M. No. 28,686.

[Extracted from the "Official Journal" for Oct. 17.]

Nos. 28,801—29,617.

BECKER, A. C.—"Town gas distribution system." No. 29,194.
BRITISH FURNACES, LTD.—"Gas burners." No. 29,013.
CHAPMAN, F. W.—"Geysers." No. 29,376.
DAVIS, K. N.—"Gas-heated radiators." Nos. 29,149, 29,150.
GENERAL GAS APPLIANCES, LTD.—"Thermostatically-controlled valves." No. 29,423.
IMPERIAL CHEMICAL INDUSTRIES, LTD.—"Removal of ammonia from coal distillation gases." No. 29,545.
JONES, E. H. P.—"Geysers." No. 29,511.
LANGER, R.—"Thermostatic controls for gas burners." No. 28,968.
RADIATION, LTD.—See Davis, K. N. Nos. 29,149, 29,150.
REBER, J. W.—"Cooling coke." No. 29,448.
SMITH, E. W.—See British Furnaces, Ltd. No. 29,013.
STOW, A. A.—See Jones, E. H. P. No. 29,511.
SURFACE COMBUSTION COMPANY.—See British Furnaces, Ltd. No. 29,013.
TWIGG, W. R.—See Davis, K. N. Nos. 29,149, 29,150.
TYRER, D.—See Imperial Chemical Industries, Ltd. No. 29,545.
WEST, E.—"Vertical retorts." Nos. 29,313, 29,314, 29,315.
WEST'S GAS IMPROVEMENT COMPANY, LTD.—See West, E. Nos. 29,313, 29,314, 29,315.
WOODALL-DUCKHAM (1920), LTD.—See Reber, J. W. No. 29,448.

MISCELLANEOUS NEWS.

GAS MAINS IN SUBWAYS.

Risks of Explosions.

In a report to the Home Secretary and the Lord Mayor of London on the two Embankment subway fires which occurred in September, Dr. F. J. Waldo, Coroner for the City of London, observes:

In view of the extent of the subways in London, a little over six miles in length, it is desirable to weigh carefully the risks attending their use, as revealed by the three inquiries. These risks may be divided into: (1) Flooding, (2) fire and gas explosion.

1. Flooding.—The damage therefrom to electric plant has been abundantly demonstrated. It may be suggested, accordingly, that special precautions should be taken to protect the subway openings against floods.

2. Fire.—The Victoria Embankment and Queen Victoria Street subways are continuous, and one may walk from the Mansion House to the Houses of Parliament, a distance of over two miles. In the event of subway fire, the experience of Sept. 8 shows that the extent of the fire tends to be limited to the space between adjacent airways, even in the absence of fire-extinguishing appliances.

Gas Mains.

The risks of gas explosion cannot be lightly dismissed. So long as gas mains are permitted to be associated with high-voltage electric cables in a subway, so long, in my opinion, must the risk of ignition and of explosion be present. On that point I differ from the jury. It was shown in evidence on Sept. 8 that the joints of the 36-in. gas mains within the area of the fire, 25 in number, were so damaged that every joint was leaking. The combustible contents of the subway were situated in the upper half, so that presumably there would be strong currents of air set up below. These currents would be drawn in from opposite ends of the burning section of the subway, and would join in the updraught through the ventilating openings at each end of the burning section. Small jets of gas from leakage, if lighted, might be blown out, and renewed leakage might then cause an explosive mixture of gas and air.

There is no need to enlarge upon the danger of a gas explosion on a large scale, and such as one would look for in dealing with two 36-in. mains in a subway. It would equal that of an earthquake. In the event of such an explosion in the Embankment subway, damage to the river wall would probably add water to the forces of destruction. My own view is that if gas mains are placed in subways, they should be encased in concrete or other imperishable material. Further, that in no circumstances is it wise to introduce high-tension cables into these underground passages in conjunction with coal gas, wood, or other inflammable or combustible materials.

METROPOLITAN GAS COMPANIES' OFFICIAL TESTINGS.

The Gas Referee's reports of the official testings for the past quarter give the following average calorific values for the gas supplied by the Metropolitan Companies named.

Commercial Gas Company.—504·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

Gas Light and Coke Company.—503 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—562·4 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—503·4 B.Th.U. (declared calorific value, 500 B.Th.U.).

Tottenham District Light, Heat, and Power Company.—502·6 B.Th.U. (declared calorific value, 500 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—472·5 B.Th.U. (declared calorific value, 470 B.Th.U.).

Sheppy Gas Company's Stock Issue.—The Directors of the Sheppy Gas Company, as announced in our advertisement columns to-day, have instructed Messrs. A. & W. Richards, of 37, Walbrook, E.C. 4, to offer for sale by tender £10,000 of 6 p.ct. preference stock (irredeemable); the minimum price of issue being par. Tenders for the stock must arrive at Messrs. Richards not later than 11 o'clock on Wednesday, Oct. 31.

South Suburban Gas Stock Tenders.—It is announced with regard to the South Suburban Gas Company's sale by tender of £300,000 of 5 p.ct. ordinary stock and £100,000 of 5 p.ct. perpetual debenture stock, that the total amount of ordinary stock applied for exceeded £700,000. The price of the lowest tender accepted was 107 p.ct., which received about 22 p.ct.; above in full. The average rate per cent. was £107 9s. 9d. Applications for 5 p.ct. perpetual debenture stock at the minimum price of £99 p.ct. received slightly over 25 p.ct.

New Retorts at Halifax.—The formal inauguration of the recently completed vertical retorts at the Halifax Corporation Gas-Works was celebrated privately by the Gas Department on Oct. 15. There was a social gathering of the employees at the Café Royal, where some 170 employees were entertained in the afternoon, and 180 in the evening. Alderman J. H. Waddington, the Chairman of the Gas Committee, told the workers that their undertaking was the oldest trading department in the Corporation, having been taken over from a private company in 1855. During the last forty years the undertaking had contributed £400,000 to the relief of rates; and had this been used in reducing capital charges, they would now have been clear of debt.

DUNDEE GAS DEPARTMENT.

Annual Report.

In his report of the working of the Corporation of Dundee Gas Department for the year ended May 15, Mr. J. Dickson, the Engineer and Manager, stated that the increase of 32 million c.ft. of gas accounted for might be considered satisfactory. This figure included gas used on the works. A total of over 111,000 tons of coal was carbonized, and the amount of gas made exceeded 1808 million c.ft., inclusive of water gas.

There was an increase of 44 million c.ft. in the quantity of gas manufactured; and the other results, with the exception of the gas produced per ton of coal, showed a considerable advance upon the figures of the previous year. During the past year the yield of gas per ton of coal averaged 72·66 therms, and the report of the examiner in respect of quality, pressure, and purity was, without exception, favourable. The number of consumers increased by over a thousand, and their total at May 15 stood at 55,950, while there was a proportionate increase in the appliances supplied.

Several extensions to the manufacturing plant were brought into operation during the year. These included a set of four purifiers, a waste-heat boiler, and an additional tar still, while work was commenced on the erection of two duplicate compressors, each capable of dealing with 200,000 c.ft. of gas per hour at a pressure of 10 lbs. per sq. in. The total expenditure involved amounted to £43,961.

There was a profit on the year's working of £24,290, which enabled a reduction to be effected in the price of gas to 3s. per 1000 c.ft. (8d. per therm), subject to a discount of 5 p.ct. for ordinary consumers, and to 3s. 2d. for prepayment consumers. For industrial consumers of over 50,000 c.ft. per annum, prices ranged from 2s. 8·175d. to as low as 2s. 0¾d., subject to a 5 p.ct. discount for payment within 28 days.

In conclusion, Mr. Dickson expressed his appreciation of the services rendered by the staff, and of the support received from the members of the Gas Committee and the Town Council towards the equipment of the undertaking on modern lines.

COLWYN BAY CORPORATION GAS DEPARTMENT.

Annual Report.

At a meeting of the Colwyn Bay Urban Council on Tuesday, Oct. 16, Mr. J. Holman (Chairman of the Lighting Committee) submitted the accounts of the gas undertaking for the past year. He said the income from the sales of gas, residuals, &c., amounted to £48,480, the working expenses being £33,802, leaving a gross profit of £14,678, against a net estimated profit of £14,122. Interest on loans and other payments absorbed £10,122, leaving a net surplus of £4556, which was carried to appropriation account, bringing the surplus on that account up to £8072. The Committee recommended a reduction of 5d. per 1000 c.ft. as from the readings of the meters for the December quarter.

The quantity of gas made during the year from 10,993 tons of coal was 210 million c.ft., leaving 3115 tons of coke and 9187 gallons of tar for sale. The amount of gas unaccounted for remained at the low figure of 6·55 p.ct. The gas sold per ton of coal used was 18,099 c.ft.

The proposed reduced charges would leave the price of gas at the pre-war figure, though the increased cost of freightage alone was close on 5d. per 1000 c.ft. sold above the pre-war basis. The charges were practically 25 p.ct. under the lowest price in the North Wales area, and in many cases 75 p.ct. less.

Industry's Debt to Pure Science.—A course of nine public lectures on this subject commenced last Wednesday at King's College, University of London, when Sir Oliver Lodge, the Principal, delivered an address. The lectures will be held each Wednesday at 5.30 p.m., and admission is free.

Coal Tests at Huddersfield.—The Huddersfield Smoke Abatement Council have decided to approach the Corporation with a view to getting that authority to carry out tests for calorific values on the coal bought by local manufacturers. The Corporation are well equipped for making such tests, and it is contended that this will be of considerable assistance in the campaign against the smoke evil.

Cheaper Gas at St. Columb.—At the annual meeting of the St. Columb Gas Company on Oct 16, Mr. W. H. Polkinghorne, the Chairman, observed that the output of gas had been well maintained, and an adequate supply had been given throughout the year. A dividend at the rate of 7½ p.ct. per annum was declared, and it was decided that a reduction in the price of gas of 6d. per 1000 c.ft. should be made as from Oct. 1. It was also resolved to undertake the work of laying on gas supplies to the Council houses at West Park.

British Benzol and Coal Distillation, Ltd.—At a meeting of this Company on Oct. 16, the Chairman, Major-General Sir Neill Malcolm, referring to the plant now under construction at Bedwas, said that the contractors had made excellent progress, and that the Company had entered into a contract to buy their coal at the favourable price of 11s. per ton for the next fifteen years. While they would produce a large quantity of benzole, their principal return would come from the sale of foundry coke. They also anticipated obtaining a further source of income from the sale of domestic coke. In addition, they were closely investigating the question of producing powdered fuel.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The improvement in the Northumberland position is maintained, and prices now quoted are 3d. to 6d. above the fixed minimum. The past week has seen a better tone also in some sections of the Durham market, though here the position is still very unsatisfactory. Gas coals have perhaps been slightly better taken, and the poorer qualities are rather steadier. A certain amount of coking coal trade has been booked for next year; but low prices have been taken, and the prompt situation has not been eased. Bunker qualities are no better, and are generally short of trade.

Nominal quotations remain mostly unchanged. Northumberland screened steams ask 13s. 9d. to 14s. f.o.b. for best sorts, against the agreed minimum of 13s. 6d. Wear Special gas makes quote 15s., and best qualities 14s. 9d. Seconds and others are 13s. to 13s. 6d. Unscreened coking is nominally 13s. 3d. to 13s. 6d. Best bunkers ask 13s. 6d. to 13s. 9d., while ordinaries are weak at 13s.

Gas coke is called 20s. 6d. to 21s. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

The gas coal trade in Yorkshire and Lancashire shows no material alteration; but there are indications of forward prices being slightly advanced.

Industrial coal is not quite so firm as it has been during the last few weeks, and some of the unwashed fuels are discounted.

The export market shows no alteration.

Domestic coal is fairly steady, with increased demand for the better graded fuel. Secondary qualities have moved only slowly.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 20s. to 20s. 6d., export 16s. to 16s. 6d.; screened gas coal, export 15s. 6d. to 16s.; washed trebles, 15s. 6d. to 16s.; washed doubles, 14s. 6d. to 15s.; washed singles, 13s. 6d. to 14s.; washed smalls, bunkers 14s. 3d. to 14s. 6d., export 10s. 6d. to 11s.; smithy peas, export 16s. 6d. to 17s. 6d. per ton.

West Yorkshire—Hartley's (f.o.b. Goole), bunkers 16s. 6d. to 17s. 6d., export 14s. to 15s.; screened gas coal, export 14s. to 15s.; washed trebles, 15s. 6d. to 16s.; washed doubles, 13s. 6d. to 14s.; washed singles, 13s. to 13s. 3d.; washed smalls, bunkers 14s. 6d. to 15s., export 10s. to 10s. 6d.; unwashed trebles, export 14s. 6d.; unwashed doubles, 11s. to 11s. 6d.; rough slack, 8s. 9d. to 9s. 3d.; coking smalls, 8s. 6d. to 9s. 6d. per ton.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 9d. to 20s., export 15s. 6d. to 16s. 6d.; cobbles, export 15s. 6d. to 16s. 6d.; washed trebles, 15s. 6d. to 16s.; washed doubles, 13s. to 13s. 6d.; washed singles, 12s. 9d. to 13s. 3d.; washed smalls, bunkers 14s. 3d. to 14s. 6d., export 10s. 6d.; unwashed doubles, export 11s. to 11s. 6d.; rough slack, bunkers 12s. 6d. to 13s., export 8s. to 9s. per ton.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. to 18s., export 13s.; gas coke, export 21s. to 22s. 6d.; furnace coke, 19s. to 19s. 6d.; washed steam (Goole, West Yorks.) 16s. to 16s. 6d., ditto (Hull, West Yorks.) 17s. 9d., ditto (Hull, South Yorks.) 17s. 9d. to 18s. bunkers, 14s. 6d. to 15s. export.

MIDLANDS.

Trade continues sluggish. The restriction of output has brought stocks within manageable compass, but it has involved no shortage of supplies. Collieries which were getting behind with their deliveries of coal for household consumption have overtaken orders in the quiet time that has supervened in the past week or two.

Anything like a sharp fall in the temperature would probably put a severe strain upon productive resources in the case of some pits, as it would certainly involve tension on the distributive side. While householders are apathetic, merchants are very much disposed to let matters take their course. In the light of experience they do not estimate very highly the chances of profit to themselves from the laying down of stocks. The margin of insurance against eventualities is therefore comparatively slender.

While more fuel is going into consumption in public utility services, requirements are so largely forestalled that there is still little effect on current market conditions. The purely industrial consumption has increased a little.

There is more activity in a few of the metallurgical branches. Nothing has occurred materially to rally the price of coke. Blast-furnace grades rule round 12s. 6d. at ovens. Slack is a trifle firmer, but there is no deficiency.

Good Progress at Haslemere.—The annual general meeting of the Haslemere and District Gas Company was held on Oct. 3 at the Company's Offices, with Dr. A. Lyndon, O.B.E., in the chair. The Directors' report on the accounts and balance-sheet for the year ended June 30 showed a profit amounting to £6152. After payment of interest, preference dividend, and the interim dividend on the "A" and "B" ordinary stock, and bringing forward the sum of £4740 from last year's account, together with other interest, there was an available balance of £7968. A dividend on the "A" ordinary stock at the rate of 10 p.ct. per annum and on the "B" ordinary stock at 7 p.ct. was declared; and £1000 was placed to the general reserve fund, £400 to the benevolent fund, £600 to the contingency fund, and £4728 was carried forward. The Chairman said that the amount of gas sold exceeded that of the previous year by 1,557,300 c.ft., and as from Sept. 30, 1927, the price of gas was reduced by 4½d. per 1000 c.ft. An electrically operated retort-charging machine and coal-handling plant had recently been installed, as well as a coke-cutting machine and improved furnaces for the steam boilers, enabling the burning of low-grade fuel. Mr. Humphrey seconded the motion, and the meeting concluded with a vote of thanks to the Directors.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 22.

There is little change to report in the position of pitch; but at the current level of prices buyers are displaying more interest. To-day's values are as follows:

Pitch, 40s. to 42s. 6d. per ton.
Creosote is about 7d. per gallon.
Pure benzole is about 1s. 8d. per gallon.
Solvent naphtha 95/160 is 1s. 5d. to 1s. 6d. per gallon.
Pure toluole is about 2s. per gallon.
Pyridine is about 5s. per gallon.

Tar Products in the Provinces.

Oct. 22.

The average prices of gas-works products during the week were: Gas-works tar, 31s. 6d. to 36s. 6d. Pitch—East Coast, 42s. 6d. to 45s. f.o.b. West Coast—Manchester, 37s. 6d. to 38s. 6d.; Liverpool, 39s. 6d. to 40s. 6d.; Clyde, 39s. 6d. to 40s. 6d. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid, 5⅞d. to 6d.; salty, 5⅝d. to 5⅞d.; Scotland, 5⅝d. to 5⅞d. Heavy oils, in bulk, North, 8½d. to 8¾d. Carbolic acid, 60 p.ct., 1s. 11d. to 2s. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.	
Crude benzole . . .	0 10½	to	0 11	per gallon at works
Motor ,, . . .	1 4½	,,	1 5	,, ,, ,,
90 p.ct. ,, . . .	1 7	,,	1 8	,, ,, ,,
Pure ,, . . .	1 10	,,	1 11	,, ,, ,,

TRADE NOTES.

Beautiful Glassware.

"Hailglass-Ware" is far too well known to our readers to require any introduction in these columns. Messrs. Hailwood & Ackroyd, Ltd., of Morley, offer an extensive range of bowls, globes, and shades for this season, suitable for any design of lighting fitting; and they are most attractively illustrated in their latest catalogue.

Fifty Years of Progress.

Messrs. Thos. W. Ward, Ltd., of Albion Works, Sheffield, have just published a most attractive brochure to celebrate the jubilee of their business. The book is beautifully prepared, and contains over fifty pages of interesting information and illustrations concerning the various undertakings of this progressive and old-established firm.

Gas Demonstrations at Buxton.—The Buxton Corporation Gas Department have arranged for Miss H. H. Tuxford to give a series of demonstrations with gas cookers at the Gas Service Rooms, Higher Buxton, during the week commencing Dec. 3. These lectures, which are organized annually by Mr. F. G. Shaw, the Borough Gas Engineer, are very popular, and have been the means of increasing considerably the sales of the Department in gas appliances, as the people who attend are also introduced to other attractive lines, with very gratifying results.

Premier Gas Mantles, Ltd.—The Official Receiver in the Companies Winding-Up Division of the High Court of Justice has issued his observations concerning the compulsory liquidation of Premier Gas Mantles, Ltd., of 10, South Street, E.C. 2, which Company, in June, 1925, acquired the business of the Evelyn Manufacturing Company, Ltd., and the lease of the Imperial Works, Deptford. The statement of affairs shows, as regards creditors, gross liabilities of £10,249, of which £5398 is expected to rank. The total assets are valued at £4990; but after deducting £51 for preferential claims and £4799 in respect of debenture claims, the net assets are estimated at £139. The paid-up capital is £7000, and there is a total deficiency of £12,259 in regard to contributories. The winding-up order was made on July 2 of this year; and the failure of the Company is attributed by a Director to lack of working capital. In the opinion of the Official Receiver, the failure is due to mismanagement on the part of the Directors, in that no provision was made for adequate working capital.

Discount Scheme at Penistone.—In an endeavour to make the charge for gas to various consumers approximate more closely to the actual cost of supplying such consumers, the Penistone and District Gas Company have decided to introduce from Oct. 1 a discount on quantity consumed. Certain standing charges are incurred by the supply to a consumer, whether he be large or small, but such charges fall in extent per consumer when the consumption is increased. In order to pass on the benefit of such reductions in standing charges to those consumers who, by their larger consumptions, are enabling production costs to be lowered, the Company have initiated a scale of discounts as follows: Under 4000 c.ft. per quarter, 2½ p.ct. (or 1½d. per 1000 c.ft.); between 4000 and 8000 c.ft., 7½ p.ct. (or 4½d. per 1000 c.ft.); between 8000 and 12,000 c.ft., 10 p.ct. (or 6d. per 1000 c.ft.); and over 12,000 c.ft., 15 p.ct. (or 9d. per 1000 c.ft.). A Gas Exhibition in St. John's School, Penistone, is being held this week, at which all the latest designs in gas cookers, fires, boilers, refrigerators, &c., are on view, while cookery demonstrations are being given twice daily.

Will.—Dr. Edmund Henry Parker, LL.D., J.P., who was Chairman of the Cambridge University and Town Gas Light Company for thirty years, left unsettled estate of the gross value of £49,872, with net personalty £35,172.

Cleethorpes Trades Exhibition.—Commencing to-morrow (Oct. 25), and continuing until Nov. 3, the Cleethorpes Trades Exhibition will be held in the Gas Company's Exhibition Halls. Councillor W. F. George, J.P., Chairman of the Urban District Council, will perform the opening ceremony. The official programme contains a syllabus of an attractive series of lectures by Miss N. Longworth, who will demonstrate and lecture on modern gas cookery. On Friday evening, Nov. 2, Mr. F. Brinsley, M.Sc. (of Radiation, Ltd.), will deliver a lecture.

Progress at Johnstone.—The Engineer and Manager of the Johnstone Gas-Works (Mr. W. A. Dearden) has presented to the Gas Committee his third annual report on the working of the undertaking during the year ended May 15. The expenditure on the revenue account amounted to £19,077, and the income to £26,228. After various necessary deductions for interest, expenses, &c., there remained a sum of £632 surplus on the year's working, to which was added £348 brought forward from the previous year. A total of 6673 tons of coal was carbonized, and 128 million c.ft. of gas made —equivalent to 81·56 therms per ton. A heavy retort repair, involving the expenditure of £859, was carried through, and over 1000 yards of new mains were laid. As from the October survey of the meters, the price of gas was reduced by 2½d. per 1000 c.ft., to 2s. 7½d., while gas supplied for public lighting was charged at the rate of 1d. per therm.

End of the Newport (Salop) Gas-Works Lease.—The lease of the Newport (Salop) Gas-Works to the present Company ends in a few years' time, and an attempt is being made by the Marsh Trustees to vest the works at once in the Urban District Council. A letter from the Charity Commissioners, stating that they agreed in principle with the Marsh Trustees entering into an agreement with the Urban Council, was received with much concern at a meeting of the Urban Council last week. A Committee, reporting on the subject, stated that the main idea in approaching the Trustees was to discover some method of bridging the gap between now and the end of the lease. It was essential for the Council to obtain powers to enable their purpose of expanding the undertaking to be carried out, either by an early arrangement with the present Company for the surrender of their lease, or by some other method. These powers could only be effectively obtained by an Act of Parliament. The Committee were of opinion that the Marsh Trustees should be asked to co-operate with the Council in promoting a Bill in the next session of Parliament for effecting the transfer to the Council of the interest of the trustees in the gas undertaking. It was resolved to write to the Marsh Trustees making this suggestion.

Lower Charges at Chesterfield.—The Chesterfield Corporation have decided to reduce the charges for gas in excess of the first 100 therms per quarter to 6d. per therm to all consumers within the borough, and to 7d. per therm to those outside the borough.

Leakage at Swadlincote.—It was reported to the Swadlincote Urban Council last week that, of the 70 million c.ft. of gas manufactured during the year, 20 million c.ft. was unaccounted for. It was also stated that 50 p.ct. of the gas distributed was taken by prepayment users. In order to reduce the amount of gas unaccounted for, the Gas Manager is carrying out an exhaustive examination of the mains.

The Richmond (Yorkshire) Town Council have received powers, under a Gas Order, by which they intend to supply gas to the Sleegill district.

Messrs. Brown & Polson, who have been holding successful cookery demonstrations at Buxton, used gas cookers hired from the Buxton Corporation Gas Department.

In the "Sunday Dispatch" of Oct. 7 the first prize in the "Ad-Spotting" Competition was won by a competitor who used the Wilson "Sunbeam" gas fire as a subject.

"Even a gasholder," says Sir Michael Sadler, "rightly placed, and wisely painted, may be as impressive as the wheat elevators of Manitoba or the cornricks of a Cotswold skyline!"

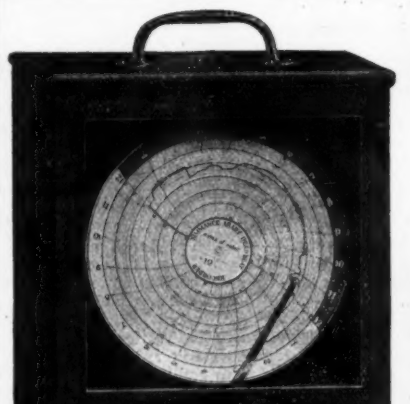
Messrs. W. S. Bagshaw & Sons, of Uttoxeter, last week sold by public auction fifty 6 p.ct. cumulative preference shares of £5 each in the Uttoxeter Gas Company at £5 1s. per share.

At the recent "Western Mail" Brighter Homes Exhibition in Cardiff there were daily demonstrations in gas cooking, which, among other things, included the cooking of a full dinner in the oven.

An interesting photograph appeared in the "Dundee Courier" of Oct. 9, showing one of the miniature 0-4-0 type steam engines at work on the Dundee Gas-Works light railway. These little locomotives have been in service now for nearly thirty years.

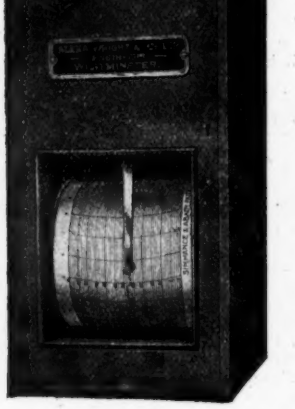
The Kidsgrove Gas Light Company have reported to the Alsager Urban Council that they have canvassed the householders in the Linley area, but as there did not seem to be a sufficient demand for gas, they did not propose to proceed with the scheme for providing a supply at present.

The Plymouth and Stonehouse Gas Company have circularized the whole of their consumers, inviting permission for their representative to inspect the houses and examine the gasfittings, so as to be able to satisfy the Company and the consumers that everything is as it should be, and to place expert advice at the consumers' disposal.

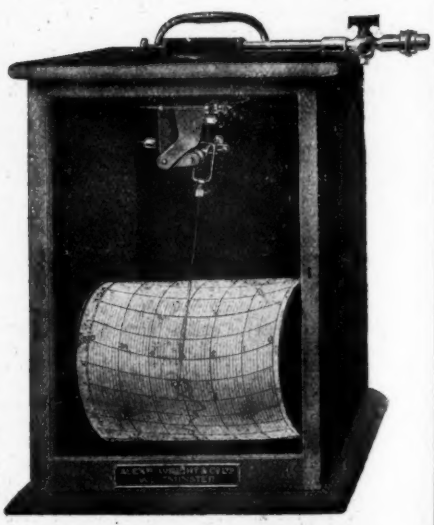


PORTABLE RECORDERS

(SIMMANCE PATENT DEAD BEAT).



IN MANY RANGES FOR ALL PURPOSES.



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WESTMINSTER, S.W. 1.

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STOCK MARKET REPORT.

THE outstanding feature of the past week was the large number of new issues. These were mostly of a speculative character, and may have accounted for the noticeable reduction in the Industrial Market transactions. Be that as it may, it is becoming more and more evident that a change is taking place in the nature of the business done on the Exchange, and there is a decided easing down of the abnormally high prices of the speculative shares. Gilt-edged investments, however, maintained their strength, and the steady upward movement of the past few weeks is remarkable. The large demand for this class of investment is illustrated by the success of the Birmingham loan, in respect of which it was anticipated a large amount would be left with the underwriters.

In the Gas Market the demand still exceeds the supply, as is evidenced by the large oversubscription of the South Suburban issue. This demand is not confined to the large London Companies; there are standing orders for various Provincial and Indian companies. Oriental ordinary, which has attracted a good deal of attention during the past year, is now quoted at 115-118, and there are buyers, but no sellers, at 120. A good deal of interest is being taken in Barnet ordinary, the price of which has risen 5 points in the last two weeks. Colombo ordinary recovered its loss of 1s. during the previous week; and the numerous Wandsworth stocks were all marked up, the improvements varying from 2 points on the "C" and New to 5 points on the "A" stock.

The following transactions were recorded during the week:

On Monday, Bristol 5 p.ct. 89⅝, British 116, Continental Union 37, Gas Light and Coke 19s. 3d., 19s. 4½d., 19s. 7½d., 4 p.ct. pref. 78¾, 3½ p.ct. max. 64, Imperial Continental 172½, 174, 175, Primitiva 25s. 3d., 25s. 4½d., 25s. 6d., 25s. 7⅛d., South Metropolitan 6 p.ct. pref. 111¾, 112½, Swansea 7 p.ct. pref. 101½, 6½ p.ct. deb. 101½, Tottenham "B" 100. Supplementary prices, Gas Light and Coke 5 p.ct. deb. 1952-57 101½, Metropolitan (of Melbourne) 5½ p.ct. deb. 100¼, Southend-on-Sea 5 p.ct. deb. 94½.

On Tuesday, Barnet District 7 p.ct. 112½, Bournemouth "B" 12 7/16, British 115, Continental Union 36½, 38, European 8¼, Gas Light and Coke 19s. 3d., 19s. 4¼d., 19s. 5¼d., 19s. 6d., 3½ p.ct. max. 62¾, 63¼, 4 p.ct. pref. 77⅜, 78, 78⅝, Imperial Continental 173, 173½, 174½, 174⅜, Primitiva 25s. 4½d., 25s. 6d., South Metropolitan 107½, 6½ p.ct. deb. 101, Swansea 6½ p.ct. deb. 102. Supplementary prices, Ascot District 10 p.ct. max. 11, Additional 7 p.ct. max. 9, Cheltenham 5 p.ct. max. 71, 4 p.ct. deb. 69, Croydon 6 p.ct. deb. 100, 100½, Gas Light and Coke 5 p.ct. deb. 1952-57 101⅜, Liverpool 5 p.ct. 90⅜.

On Wednesday, Bournemouth "B" 12 9/16, British 115, Continental Union 37⅜, 38, 38¼, 38½, Gas Light and Coke 19s. 3d., 19s. 6d., 4 p.ct. pref. 77¾, 3 p.ct. deb. 61¼, Imperial Continental 174½, 174⅜, Primitiva 25s. 3d., 25s. 6d., 25s. 7½d., South Suburban 5 p.ct. 108⅜. Supplementary prices, Gas Light and Coke 5 p.ct. deb. 1952-57 101½, Grays and Tilbury "B" £10 2s., Liverpool 5 p.ct. 91, Metropolitan (of Melbourne) 5½ p.ct. deb. 100¼.

On Thursday, Alliance and Dublin 97½, Bournemouth "B" 12 9/16, 12⅝, 12¾, 4 p.ct. deb. 76, British 115, Croydon max. div. 85, European 8½, Gas Light and Coke 19s. 3d., 19s. 4d., 19s. 5¼d., 3½ p.ct. max. 63⅜, 64, 4 p.ct. pref. 78, 3 p.ct. deb. 61⅝, Hong Kong and China 13¼, Imperial Continental 174½, Primitiva 25s. 4½d., 25s. 6d., 25s. 7½d., 25s. 9d., South Suburban 5 p.ct. 108⅜, Tottenham "B" 100. Supplementary prices, North Middlesex 6 p.ct pref. 110, 110½, 110½, Tottenham 5 p.ct. pref. 91, 5 p.ct. Reg. Red. mortgages 98½.

On Friday, Barnet District 7 p.ct. max. 115½, 116, Bournemouth "B" 12 9/16, 12⅝, British 116, 116½, Commercial 99½, 100, Continental Union 37⅜, Gas Light and Coke 19s. 3d., 19s. 4½d., 19s. 6d., 4 p.ct. pref. 78, 78½, Liverpool 7 p.ct. pref. 101½, Oriental 117½, Primitiva 25s. 3d., 25s. 4½d., 25s. 6d., 25s. 7½d., South Metropolitan 107½, 108½, South Suburban 5 p.ct. 109, Southampton 5 p.ct. 77½, Swansea 7 p.ct. pref. 102, Tottenham "B" 101. Supplementary prices, Brighton and Hove 7 p.ct. deb. 105, Croydon 7 p.ct. deb. 103, Gas Light and Coke 5 p.ct. deb. 1952-57 101½, Liverpool 5 p.ct. 91, North Middlesex 6 p.ct. pref. 110, 110½.

In Lombard Street money supplies were sufficient for the demand. Discount rates were a little firmer on rumours of gold shipments to Germany, and this probably accounted for the slight rise in the average Treasury Bill rate, which at £4 7s. 8·35d. p.ct. was nearly 1d. p.ct. above the previous week's rate. The rate for new and old loans was generally 3½ p.ct.; but towards the close on Friday the quotation declined to 3½ p.ct.

On the Foreign Exchange Market, most of the movements were again small. Sterling on New York with Paris selling was 1/64 p.ct. easier at 4.85 1/64; and with German marks in demand, the Berlin rate fell to 20.35½. The French currency appreciated, the Paris rate closing at 124.18½; Spanish pesetas showed wide fluctuations, but finally closed 1c. lower at 30.15; Belgas were higher at 34.89½; and Italian lire were unchanged at 92.57½.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Oct. 19.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug 30	5	5	Aldershot 5 p.c. max. C. .	72—77	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	68—71	..	..
1,551,868	,,	Sept. 27	7	7½	Alliance & Dublin Ord. .	95—98	..	97½
374,000	,,	July 12	4	4	Do. 4 p.c. Deb. . .	63—66	..	..
523,654	,,	Aug. 30	7	7	Barnet Ord. 7 p.c. . . .	114—117	+3	112½—116
300,000	1	Oct 11	1/5½	1/4½	Bombay, Ltd.	20/—22/-*	..	..
170,000	10	Aug. 30	8½	8½	Bournemouth 5 p.c. . . .	12½—13½	..	..
500,050	10	,,	7	7	Do. B 7 p.c. . . .	12½—12⅝	..	12 9/16—12⅝
375,000	10	,,	6	6	Do. Pref. 6 p.c. .	10¼—11⅛	..	..
50,000	Stk.	July 12	3	3	Do. 3 p.c. Deb. .	56—59	..	..
163,025	,,	,,	4	4	Do. 4 p.c. Deb. .	75—78	..	76
857,900	,,	Aug. 20	7½	7½	Brighton & Hove 6 p.c. Con.	114—117	..	..
341,880	,,	,,	6½	6½	Do. 5 p.c. Con.	101—104	..	..
1,287,500	,,	July 28	5	5	Bristol 5 p.c. max. . . .	90½—91¼a	..	..
885,000	,,	Sept. 27	7	8	British Ord.	114—117	..	115—116½
100,000	,,	June 28	7	7	Do. 7 p.c. Pref. . . .	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	74—77	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	95—98	..	..
100,000	10	May 24	6	8	Cape Town, Ltd. . . .	8—9	..	..
100,000	10	Apl 26	4½	4½	Do. 4½ p.c. Pref. . .	6¾—7½	..	..
150,000	Stk.	June 28	4½	4½	Do. 4½ p.c. Deb. . .	78—78	..	..
626,860	,,	July 26	6	6	Cardiff Con. Ord. . . .	96—99	..	..
287,860	,,	June 28	7½	7½	Do. 7½ p.c. Red. Deb. .	100—103	..	..
167,150	,,	Aug. 16	6⅜	5	Chester 5 p.c. Ord. . . .	88—93b	..	..
79,185	1	Oct. 11	12/-	12/-	Colombo Ltd. Ord. . . .	36/—38/-*	+1/-	..
24,495	1	,,	1/4‡	1/4‡	Do. 7 p.c. Pref. . .	20/6—22/6*	..	..
375,402	1	Oct. 11	1/9‡	1/9‡	Colonial Gas Assn. Ld. Ord.	23/—25/-*	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	21/—23/*	..	..
2,073,280	Stk.	July 26	7	5	Commercial Ord.	98—101	..	99½—100
475,000	,,	June 14	8	8	Do 8 p.c. Deb. . .	57—60	..	..
900,000	,,	Sept. 27	11	11	Continental Union, Ltd. .	35—40	..	36½—38½
200,000	,,	,,	7	7	Do. 7 p.c. Pref. . .	90—95	..	..
787,560	,,	Aug. 16	7	7	Croydon sliding scale . .	109—112	..	..
408,100	,,	,,	5	5	Do. max. div. . . .	84—87	..	85
421,270	,,	Aug. 16	10	7	Derby Con.	115—120e	..	..
55,000	,,	June 28	4	4	Do. Deb.	71—73e	..	..
209,000	,,	Aug. 30	5	5	East Hull Ord. 5 p.c. . .	75—78	..	..
60,000	,,	June 28	5	5	Eastbourne 5 p.c. Deb. .	94—97	..	..
1,003,180	10	Sept. 13	16	14	European, Ltd.	8—9	..	8½
18,703,480	Stk.	July 26	5/1/4	5½	Gas Light & Coke 4 p.c. Ord.	19/1½—19/7½f	—/1½	19/3—19/7½
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max. . . .	62—64	..	62⅝—64
4,157,030	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	77—80	..	77⅜—78⅝
5,603,630	,,	June 14	8	8	Do. 8 p.c. Con. Deb. .	61—63	..	61⅛—61⅝
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	103—106	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	99—101	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb. .	..	..	..
92,500	,,	Aug. 30	6½	7	Hastings & St L. 5 p.c. Conv	95—100	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	75—80	..	13½
70,000	10	Oct. 11	†10	†10	Hongkong & China, Ltd. .	13—14*	..	..
178,200	Stk.	Aug. 30	5	5½	Hornsey Con. 3½ p.c. . .	85—87	..	..
1,976,000	,,	May 24	10	10	Imperial Continental Cap.	172—177	+1	172½—175
223,130	,,	Aug. 16	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	..
235,242	,,	Aug. 16	7	7½	Lea Bridge 5 p.c. Ord. . .	98—101	..	..
2,145,907	,,	Aug. 16	5½	5½	Liverpool 5 p.c. Ord. . .	90—91b	..	..
600,000	,,	Sept 27	7	7	Do. 7 p.c. Red. Pref.	102½—103½b	..	..
165,786	,,	Aug. 16	8	9	Maidstone 6 p.c. Cap. . .	112—117	..	..
63,480	,,	June 14	3	3	Do. 3 p.c. Deb. . .	55—58	..	..
75,000	5	June 14	†8	†8	Malta & Mediterranean .	5½—6	..	..
641,930	Stk.	May 24	†5	†7	Montevideo, Ltd. . . .	96—98	..	..
2,051,315	,,	Aug. 16	5	5	Newcastle & Gateshead Con.	16/3—16/9d‡	..	..
380,929	,,	,,	4	4	Do. 4 p.c. Pref. .	71½—72½d	..	..
691,705	,,	June 28	8½	8½	Do. 8½ p.c. Deb. .	69½—70½	..	..
131,780	,,	Aug. 30	6/18/0	7/1/0	North Middlesex 6 p.c. Con.	96—99	..	..
200,000	,,	Apl. 26	9	7	Oriental, Ltd.	115—118	..	117½
189,120	,,	June 28	7½	7½	Plym'th & Ston'house 5 p.c.	107—112	..	..
414,500	,,	Aug. 30	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	101—104	..	..
256,782	,,	,,	5	5	Do. 5 p.c. max.	79—82	..	..
1,334,464	1	—	—	—	Primitiva Ord.	25/—27/-	..	25/3—25/9
344,500	100	June 1	4	4	Do. 4 p.c. Red. Deb. . .	91—94	..	..
695,000	Stk.	July 26	4	4	Do. 4 p.c. Red. Deb. 1911	78—80	..	..
416,845	,,	June 28	4	4	Do. 4 p.c. Cons. Deb. . .	78—80	..	..
180,000	10	Sept. 27	6	6	San Paulo 6 p.c. Pref. . .	8½—8⅝	..	..
370,000	Stk.	Aug. 30	6	6½	Sheffield A	103½—104½e	..	..
419,968	,,	,,	6	6½	Do. B	103½—104½e	..	..
1,047,000	,,	,,	6	6½	Do. C	103½—104½e	..	..
90,000	10	June 14	†3	†4	South African	4—6	..	..
6,609,895	Stk.	July 26	7½	5	South Met. Ord.	107—109	..	107½—108½
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	110—113	..	111½—112⅝
1,895,445	,,	July 12	8	8	Do. 8 p.c. Deb. . .	59—61	..	..
734,000	,,	Sept. 13	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	101
91,500	,,	Aug. 16	8½	8½	South Shields Con. . . .	108—110d	..	..
1,343,795	,,	July 26	6½	6½	South Suburban Ord. 5 p.c.	108—111	+2	108⅜—109
868,827	,,	June 28	5	5	Do. 5 p.c. Deb.	98—101	+1	..
647,740	,,	Aug. 30	5	5	South'mpton Ord. 5 p.c. max.	77—79	..	77¼
121,275	,,	June 28	4	4	Do. 4 p.c. Deb.	72—75	..	..
250,000	,,	Aug. 30	7	7	Swansea 7 p.c. Red. Pref. .	101—103	..	101½—102
200,000	,,	June 28	6½	6½	Do. 6½ p.c. Red. Deb.	101—103	..	101½—102
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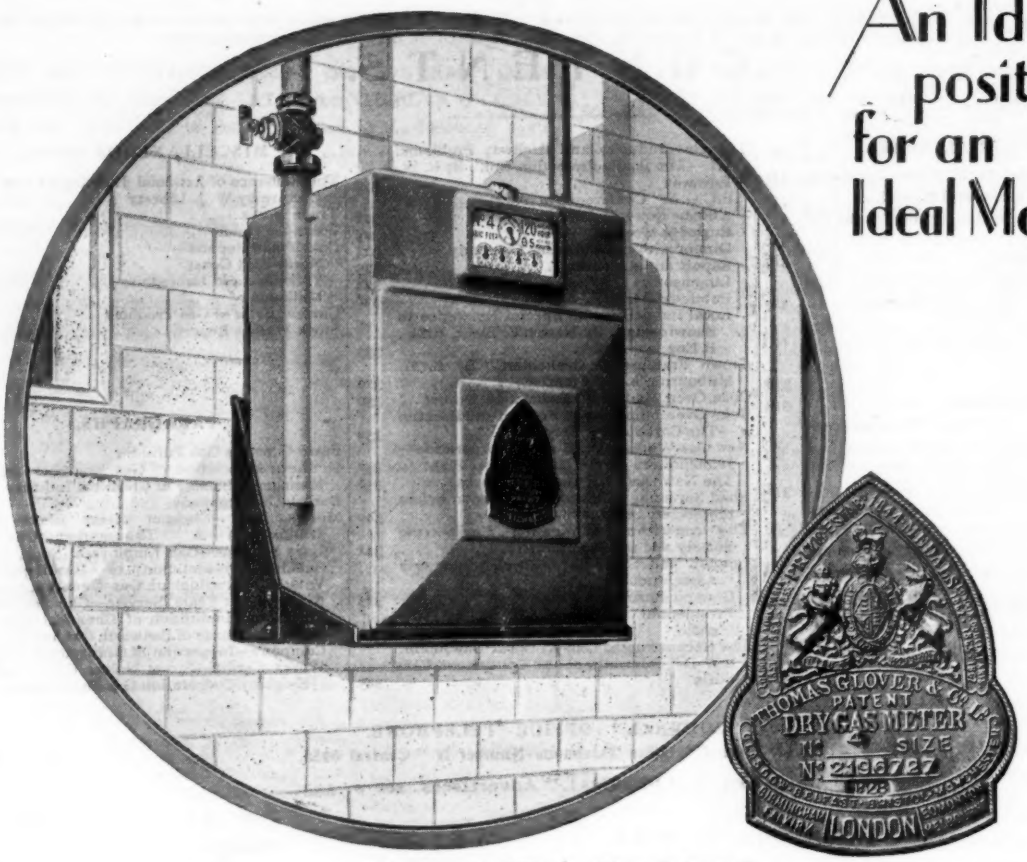

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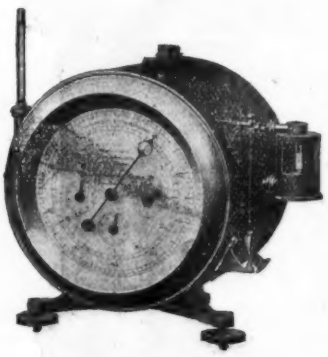

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